OMEGA SMALL VOLUME GROUP

QUALITY ASSURANCE PROJECT PLAN

OMEGA CHEMICAL OPERABLE UNIT 2, WHITTIER, CA

EPA Site ID#09BC
Docket No. 9-2004-004

ARCADIS

Infrastructure, buildings, environment, communications

ARCADIS

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ARCADIS G&M, Inc.
1400 No. Harbor Boulevard
Suite 700
Fullerton
California 92835-4127
Tel 714.278.0992
Fax 714.278.0051

Transmittal Letter

To:
Mr. Christopher Lichens
United States Environmental Protection Agency
75 Hawthorne Street
Mailstop SFD-7-4
San Francisco, CA 94105

Copies:
Ken Fredianelli, Project Navigator, Ltd.
(1 copy)
Peter McGaw, Archer Norris, LLC
(1 copy)
Project File

BUSINESS UNIT

From:
Ronald Halpern, R.G. R.H.

Date:
January 18, 2005

Subject:
Omega Chemical Operable Unit 2, Whittier, California, EPA Site ID#09BC, Docket No. 9-2004-004

ARCADIS Project No.:
CA000646.0001.00003

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3	1/18/05			Final Field Sampling Plan - Omega Chemical Operable Unit 2, Whittier, California, EPA Site ID#09BC, Docket No. 9-2004-004, prepared for Omega Small Volume Group	
3	1/18/05			Final Quality Assurance Project Plan - Omega Chemical Operable Unit 2, Whittier, California, EPA Site ID#09BC, Docket No. 9-2004-004, prepared for Omega Small Volume Group	
3	1/18/05			Response to EPA Comments dated January 5, 2005- Omega Chemical Operable Unit 2, Whittier, California, EPA Site ID#09BC, Docket No. 9-2004-004, prepared for Omega Small Volume Group	

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ARCADIS

Ronald M. Halpern
Ronald M. Halpern, RG
Project Scientist

RONALD M. HALPERN
NO. 6645
exp 10/06
STATE OF CALIFORNIA

AS Frankel
Avram Frankel, PE
Principal Engineer

Alistair Gallacher for
John Johnsen
Program Manager

Quality Assurance Project Plan

Omega Chemical Operable Unit 2, Whittier, CA

Prepared for:
Omega Small Volume Group (OSVOG)

Prepared by:
ARCADIS G&M, Inc.
1400 North Harbor Boulevard
Suite 700
Fullerton
California 92835
Tel 714 278 0992
Fax 714 278 0051

Our Ref.:
CA000646.0001

Date:
January 18, 2005

Tables

Figures

Appendices

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY REGION IX

Plan Title	Quality Assurance Project Plan Omega Chemical Superfund Site Operable Unit 2
Site Name:	Omega Chemical Superfund Site
Site Location:	Whittier
City/State/Zip:	Los Angeles County, California
Site EPA ID#:	09BC
Anticipated Sampling Dates	2004 to 2005
Prepared By:	Ronald Halpern, R.G.
Date:	January 18, 2005
Agency or Firm:	ARCADIS G&M, Inc.
Address:	1400 N. Harbor Blvd., Suite 700
City/State/Zip:	Fullerton, California 92835
Telephone:	714/278-0992
EPA Work Assignment Manager (WAM):	Christopher Lichens Section: SFD-7-4
Phone No.	415/972-3149
QAPP Approval Date:	____________________

Approved: John Johnsen ________________ Date: __________
ARCADIS Project Manager

Approved: Avram Frankel ________________ Date: __________
ARCADIS Quality Assurance Officer

Approved: Christopher Lichens ________________ Date: __________
EPA Work Assignment Manager (WAM)

Approved: Vance Fong. ________________ Date: __________
EPA Quality Assurance Manager

Distribution List

____________________	EPA Region IX Work Assignment Manager
John Johnsen	ARCADIS Project Manager
Ronald Halpern	ARCADIS Field Team Leader
____________________	ARCADIS Field Team Leader
____________________	ARCADIS Quality Assurance Manager

Acronyms

CLP	Contract Laboratory Program
COC	Chain-of-Custody
DQO	Data Quality Objective
EPA	United States Environmental Protection Agency
Freon 11	Trichlorofluoromethane
Freon 113	Trichlorotrifluoroethane
FSP	Field Sampling Plan
HSP	Health and Safety Plan
IDW	Investigation-Derived Waste
LCS	Laboratory Quality Control Samples
LOE	Level of Effort
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
NELAP	National Environmental Laboratory Accreditation Program
OSVOG	Omega Small Volume Group
OU	Operable Unit
PCE	Perchloroethene (tetrachloroethene)
PM	Project Manager
PRPs	Potentially Responsible Parties
QA/QC	Quality Assurance/Quality Control
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAT	Quality Assurance Team
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study

RPD	Relative Percent Difference
RPM	Remedial Project Manager
RSD	Relative Standard Deviation
SOP	Standard Operating Procedure
SRM	Standard Reference Material
SSC	Site Safety Coordinator
TCE	Trichloroethene
TM	Task Manager
UAO	Unilateral Administrative Order
VOC	Volatile Organic Compound
WA	Work Assignment
WAM	Work Assignment Manager

1. Introduction

This Quality Assurance Project Plan (QAPP) follows United States Environmental Protection Agency (EPA) guidelines contained in *EPA Guidance for Quality Assurance Project Plans* (EPA, 2002b), and *EPA Requirements for Quality Assurance Project Plans* (EPA, 2001). Thus, the following section headings correlate with the subtitles found in the EPA guidelines.

- Project Management
- Data Generation and Acquisition
- Assessment and Oversight
- Data Validation and Usability

Portions of the text in this document were taken from CH2M Hill's Remedial Investigation/Feasibility Study (RI/FS) Work Plan and QAPP (CH2M Hill, 2004a and 2004b).

2. Project Management/Data Quality Objectives (DQOs)

2.1 Project Organization

This remedial investigation (RI) is being performed under contract to the Omega Small Volume Group (OSVOG), a group of potentially responsible parties (PRPs) charged with performing this work in the Omega Chemical Superfund Site Operable Unit 2 (OU-2). The RI is being conducted in accordance with the EPA's First Amended Unilateral Administrative Order (UAO) for Response Action (First Amended UAO, EPA Region IX, CERCLA Docket No. 9-2004-0004). OSVOG is being represented by Mr. Peter McGaw of the Law Offices of Archer Norris. Mr. Ken Fredianelli of Project Navigator, Ltd. will be the project coordinator (PC), communicating with EPA's Remedial Project Manager (EPA RPM), Mr. Christopher Lichens, Mr. McGaw, and ARCADIS' project manager (PM), Mr. John Johnsen.

ARCADIS' PM will manage the financial, schedule, and technical status of the work assignment (WA). Key people involved in interfacing with the PM are the PC, individual task managers (TM), and members of the quality assurance team (QAT) as shown on Figure 1.

The primary responsibility for project quality rests with the PM. Independent quality control (QC) is provided by the QAT. The QAT will review project planning documents, data evaluation, and deliverables. Outside organizations may be used to evaluate the quality of laboratory data.

The sampling team will implement the QAPP, field sampling plan (FSP), and health and safety plan (HSP). The site safety coordinator (SSC) is responsible for adherence to the HSP and field decontamination procedures. The entire field effort is directed by the field team leader (FTL).

The TM is responsible for procuring and interfacing with subcontractors. Subcontractors that will be utilized on this WA include underground utility locators, traffic control providers, drillers, chemical and physical analytical laboratories, surveyors, and waste disposal contractors, and laboratory data evaluators.

Where quality assurance (QA) problems or deficiencies requiring special action are uncovered, the PM, QAT, and quality assurance officer (QAO) will identify the appropriate corrective action to be initiated by the FTL or the laboratory.

Project organization and the line of authority for ARCADIS efforts are illustrated in Figure 1. Data users and recipients are shown in Figure 2. Both EPA and ARCADIS technical personnel and QA personnel are shown.

2.2 Problem Definition/Background

2.2.1 Purpose

This QAPP presents the policies, organizations, objectives, and functional activities/procedures associated with the RI sampling/analysis and construction activities at OU-2, and includes accompanying the DQOs, which can be found in Appendix A (EPA, 2000).

2.2.2 Problem Statement

Existing groundwater and soil data indicate that elevated concentrations of volatile organic compounds (VOCs) and other compounds are present in the soil and groundwater beneath the former Omega Chemical Facility (Operable Unit 1 [OU-1]) and up to 2 miles downgradient in shallow groundwater. A series of soil gas, soil, and groundwater investigations has been performed at OU-1 by a variety of consultants beginning in 1985. Chlorinated hydrocarbons (perchloroethene [PCE], trichloroethene [TCE], 1,1-dichloroethene, cis-1,2-dichloroethene, and chloroform) and chlorofluorocarbons (trichlorofluoromethane [Freon 11] and trichlorotrifluoroethane [Freon 113]) were identified as the primary chemicals of concern directly beneath the site. Elevated total chromium also was reported in groundwater beneath the Omega site. Elevated concentrations of chemicals of concern were also reported west and southwest of the Omega facility, suggesting that a downgradient migration of the contaminant plume from the site has occurred.

OU-2 generally includes the groundwater-contaminated areas encompassing the Omega Chemical Facility and extends approximately 2.2 miles to the southwest. The vadose zone contamination at the Omega site and the highly contaminated portion of the aquifer in the immediate site vicinity are addressed as OU-1 under a separate effort. The primary objective of this investigation is to conduct an RI to estimate the vertical and lateral extent of groundwater contamination within OU-2.

2.2.3 Background

The Omega Chemical Corporation (Omega) is a former refrigerant/solvent recycling operation located in Whittier, California, a community of approximately 85,000 people. The facility is located southwest and downgradient of a residential neighborhood, across Whittier Boulevard, and within 1 mile of several schools, including three elementary schools and two high schools (Figure 3). The facility operated as a Resource Conservation and Recovery Act (RCRA) solvent and refrigerant recycling and treatment facility from approximately 1976 to 1991, handling primarily chlorinated hydrocarbons and chlorofluorocarbons. Drums and bulk loads of waste solvents and chemicals from various industrial activities were sent to the Omega facility for processing to form commercial products. Chemical, thermal, and physical treatment processes were reportedly used to recycle the waste materials. Wastes generated from these treatment and recycling activities included distillation column (still) bottoms, aqueous fractions, and nonrecoverable solvents. Additional data regarding site history, past investigations, and remediation activities are discussed in detail in the Final On-Site Soils RI/FS Work Plan (Camp Dresser & McKee [CDM], 2003) and the Omega Chemical Superfund Site, Whittier, California; Phase 2 Groundwater Characterization Study Report (Weston Solutions, Inc. [Weston], 2003).

2.2.4 Data Needs and Uses

Data needs and uses for the objectives described in this section have been identified through the DQO process presented in Appendix A.

- What is the vertical and lateral extent of the contamination in groundwater beneath OU-2; what is the nature of contamination in groundwater beneath OU-2; and, what is the trend in groundwater concentration?
- Do contaminants pose an unacceptable potential risk to human health and the environment?
- Are emergent contaminants (1,4-dioxane, perchlorate, N-nitrosodimethylamine, hexavalent chromium, and 1,2,3-trichloropropane) present in groundwater beneath OU-2?
- Where and how will Investigative Derived Waste (IDW) be disposed of.

The data needs and uses are summarized in Table 1 at the end of this section. Table 1 lists the chemicals of concern and presents regulatory criteria/action level requirements for organics and inorganics. The table presents a listing of applicable regulations and identifies the lowest regulatory criteria where there are multiple regulatory criteria/action levels for a given analyte. Table 2 lists the analytical methods and laboratory reporting limits selected to meet these criteria.

2.3 Project Description and Schedule

2.3.1 Description of Work to be Performed

A summary of the work to be performed relating to sample collection, analysis, and interpretation is provided below.

2.3.1.1 Field Investigation

ARCADIS will conduct the RI field investigation at OU-2. Samples will include groundwater samples that will be analyzed for VOCs, for screening purposes. These samples will be collected during installation of the monitoring and extraction wells. Further; groundwater samples and associated field supplicates will be collected from the wells for monitoring purposes after installation of the wells is complete.

2.3.1.2 Sample Analysis

Sample analyses will be carried out by a laboratory accredited under the National Environmental Laboratory Accreditation Program (NELAP) with a documented Quality Assurance Program which complies with ANSI/ASQC E-4 1004, "Specifications and Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Program" (American National Standard Institute, January 5, 1995) and "EPA Requirements for Quality Management Plans (QA/R-2)" (EPA, March 2001), or equivalent.

2.3.1.3 Analytical Support and Data Validation

All data for all parameters will undergo two levels of review and validation: (1) at the laboratory, and (2) outside the laboratory by ARCADIS personnel.

2.3.1.4 Data Evaluation

ARCADIS will organize and evaluate existing data and data gathered from this investigation. The data evaluation activities will include:

- Field QA/QC
- Data usability evaluation;
- Data reduction, tabulation, and evaluation; and
- Preparing a data evaluation report.

A brief data evaluation report will be prepared after completion of well installation and groundwater sampling. The data report will include a sampling location map and results tables for each medium sampled (in this case, just for groundwater).

Data usability and validation will consist of verifying the following:

- All field screening instruments (e.g., photoionization detector, pH/conductivity/temperature meter, turbidity meter) were calibrated according to their respective manufacturer's Operation and Maintenance manual. Calibration log sheets were appropriately completed and maintained in the file;
- Field and sample logs maintained and complete. Deviations from the FSP are noted in the logs;

- Samples were collected in appropriate method and placed in appropriate containers, using appropriate preservative, if any. Sample information (i.e., location, time, sampler name, matrix, preservative used, etc.) on sample label is correct;
- Appropriate field QC samples (field blanks, trip blanks, equipment blanks, duplicate samples) were collected as specified in the QAPP and FSP;
- Analytical methods requested for samples submitted for analysis were in accordance with the FSP;
- Documentation regarding sample receipt and tracking is complete;
- Analytical methods performed on the samples submitted was as requested;
- Sample holding times were within limits as specified in the QAPP and EPA publication SW-846, entitled, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (EPA, 1996), or other method references as applicable;
- Reporting limits were as specified in the QAPP;
- Appropriate calibration techniques and laboratory QC samples were prepared and analyzed (calibration standards, method blanks, duplicate samples, spiked samples, spiked blanks, interference check standards, etc.)
- Results of laboratory QC sample analysis were within acceptable limits;

The results and findings from data validation and data usability review will be summarized and incorporated into each data report.

2.3.1.5 Assessment of Risk

EPA will perform a baseline risk assessment using data collected by OSVOG as required in the UAO.

2.3.1.6 *RI Report*

ARCADIS will prepare a RI Report that describes the procedures implemented and results of the remedial investigation as dictated by the UAO. The report will include a site location map, well location map, groundwater contour map, and contaminant distribution maps for PCE, TCE, Freon 11, and Freon 113. Tables to be included in the report will include: well construction summary, well location and elevation survey data, and groundwater data (depth to water measurements, calculated elevation, and contaminant concentrations). Supporting documentation will consist of: computerized field boring logs, well construction logs, geophysical logs (if any), field equipment calibration worksheets, field groundwater monitoring forms, drum inventory forms, and copies of laboratory reports.

2.3.2 Schedule of Activities

The field investigation is expected to start in mid to late January 2005, and will end by mid-April 2005. A copy of the proposed schedule was included as Appendix B of the ARCADIS RI Work Plan (2004a).

2.4 DQOs

2.4.1 Project Quality Objectives

DQOs have been specified for each data collection activity, and the work will be conducted and documented so that the data collected are of sufficient quality for their intended use (EPA, 2000). DQOs specify the data type, quality, quantity, and uses needed to make decisions, and are the basis for designing data collection activities. The DQOs have been used to design the data collection activities presented in the FSP. Specific DQOs were considered independently through the DQO process (EPA, 1994a, 1994b, and 2000) to meet the data user's needs for each activity. Appendix A presents the DQO decision-making process for the remedial field activities.

2.4.2 Measurement Performance Criteria

The QA objective of this plan is provide data of known and appropriate quality for the needs identified in previous sections. Data quality is assessed using the following measurement performance criteria: representativeness, comparability, accuracy, precision, and completeness. These terms, the applicable procedures and level of effort (LOE) are described below.

The applicable QC procedures, quantitative targets, and LOE for assessing data quality are dictated by the intended use of the data and the nature of the analytical methods. Analytical parameters and applicable detection levels, analytical precision, accuracy, and completeness in alignment with the needs identified in Section 2.2.4 are presented in Table 2.

Reporting detection levels/target detection limits listed in Table 2 are per-method reporting limits, equivalent to contract-required detection levels. "Target" implies that final sample detection levels may be higher because of sample matrix effects or other issues. Detection levels for the individual samples will be reported in the final data. Laboratory-specific method detection limits (MDLs) are significantly below reporting levels. Where reporting limits are higher than regulatory limits, the project team will use MDLs as needed for project decisions.

Representativeness is a measure of how closely the results reflect the actual concentration or distribution of the chemical compounds in the matrix samples. Representativeness of data collection is addressed by careful preparation of the sampling and analysis program. This QAPP, together with the FSP, addresses representativeness by specifying sufficient numbers and locations of samples; incorporating standard sampling methodologies; specifying sample collection techniques, sample preservation, and decontamination procedures; selecting laboratory methods to prepare and analyze water samples; and establishing field and laboratory QA/QC procedures. The proposed sampling and analysis documentation, discussed in subsequent sections of this document, will establish the extent to which protocols have been followed and sample identification and integrity ensured.

Comparability expresses the confidence with which one data set can be compared to another. The objective of comparability is to ensure that data developed during the investigation are comparable to existing site data and can address applicable criteria or standards established by the EPA. Data comparability will be maintained by specifying sampling and laboratory methods that are consistent with the current standards of practice as approved by the EPA. Field methods are discussed in the FSP. Proposed detection limits are listed in Table 2. Actual detection limits will depend on the sample matrix and will be reported as defined for the specific samples.

Accuracy is an assessment of the closeness of the measured value to the true value. It is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systematic error. Accuracy reflects the total error (field and laboratory error) associated with a measurement. For samples, accuracy of chemical test results is assessed by spiking samples with known standards and establishing the average recovery. For a matrix spike (MS), known amounts of target compounds are added to a portion of the sample. A quantitative definition of average recovery accuracy is given in Section 5.3. If the percent recovery is determined to be outside of acceptance criteria, data will be qualified as described in the applicable validation procedures. The LOE for accuracy measurements will be a minimum frequency of 1 in 20 samples analyzed.

Field accuracy is affected by sample collection and handling procedures and by the accuracy of any field measurements. Field accuracy will be assured through careful execution of field procedures in accordance with applicable standard operating procedures (SOPs), and will be assessed through the analysis of field equipment and trip blanks. Trip blanks will be prepared and maintained for all post-well-installation groundwater sampling events. The trip blanks will only be analyzed if contamination is found in field or equipment blanks. Analysis of blanks will monitor errors associated with the sampling process, field contamination, sample preservation, and sample handling. The DQO for field equipment and trip blanks is that all values are less than the reporting limit for each target chemical. If contamination is reported in the field equipment or trip blanks, data will be qualified as described in the applicable validation procedure.

Precision measures the reproducibility of repetitive measurements. It is a measure of the data spread when more than one measurement has been collected from the same sample. Analytical precision is a measurement of the variability associated with duplicate or replicate analysis of the same sample in the laboratory, and is determined by analysis of laboratory quality control samples (LCS), such as matrix spike duplicates (MSD), or sample duplicates. Total precision is a measurement of the variability associated with the entire sampling and analytical process. It is determined by analysis of duplicate or replicate field samples, and measures variability introduced by laboratory and field operations. MSD samples are analyzed to assess analytical, matrix-related precision. Duplicate results are assessed using the relative percent difference (RPD) between duplicate measurements. A quantitative definition of precision is given in Section 5.3. The LOE for precision measurements will be a minimum of 1 in 20 samples analyzed.

Completeness is a measure of the amount of valid data obtained compared to the amount that was expected under ideal conditions. The number of valid results divided by the number of expected results, expressed as a percentage, determines the completeness of the data set. The quantitative definition of completeness is given in Section 5.3. The target completeness objective will be 90 percent; the actual completeness may vary depending on the intrinsic nature of the samples. The completeness of the data will be assessed during QC reviews.

2.5 Special Training Requirements/Certification

All project staff working on the site will be health and safety trained, and will follow requirements specified in the HSP for the project, which can be found in the companion FSP (ARCADIS, 2004b). The HSP describes the specialized training required for personnel on this project and the documentation and tracking of this training.

2.6 Documentation and Records

Field documentation and records will be as described in Section 3 of this document and the FSP. Laboratory documentation will be per: (1) methods and QA protocols listed in Section 3 of this document, and (2) laboratory-specific SOPs.

3. Measurement Data Acquisition

This section presents sampling process design and requirements for sampling methods, sample handling and custody, analytical methods, QC, and instrumentation for the sampling activities that will be conducted as a part of the RI at the Omega Chemical OU-2. Data acquisition requirements and data management for these sampling events are also addressed in this section.

3.1 Sampling Process Design

3.1.1 Background

Background information and objectives are presented in Section 2 of this document. The primary objectives of this RI are to delineate the vertical and lateral extent of groundwater contamination at the OU-2 site.

3.1.2 Schedule of Analyses

The field investigation, as outlined in the UAO, is expected to continue approximately three months after mobilization.

3.1.3 Rationale for Sampling Design

3.1.3.1 Sampling Locations and Number of Samples

Groundwater sample locations and number of samples are summarized in Section 3 of the accompanying FSP.

3.1.3.2 Laboratory Analyses

Samples will be analyzed at a NELAP-certified laboratory (see Section 2.3.1.2).

The analytical parameters for the individual samples are detailed in Table 2 as well as the accompanying FSP in the request for analyses tables.

3.2 Sampling Method Requirements

Sampling method requirements have been detailed in the associated FSP in Section 5.

3.3 Sample Handling and Custody Requirements

A sample is physical evidence collected from a hazardous waste site, from the immediate environment, or from another source. The possession of samples must be traceable from the time the samples are collected until the data are reported. In addition to field notebooks, the chain-of-custody (COC) form is used to track sample custody from the field to the laboratory. Completed COC forms will be sent to the QAO.

3.3.1 COC

3.3.1.1 Definition of Custody

A sample is under custody if one or more of the following criteria are met:

- It is in your possession.

- It is in your view, after being in your possession.
- It was in your possession and then you locked it up to prevent tampering.
- It is in a designated secure area.

3.3.1.2 Field Custody

The field sampler is personally responsible for the care and custody of the samples collected until they are transferred or dispatched properly. The FTL determines whether proper custody procedures were followed during the field work, and decides if additional samples are required.

For each sample submitted to the laboratory for analysis, an entry will be made on a COC form supplied by the laboratory. The information to be recorded includes the sampling date and time, sample identification number, matrix type, requested analyses and methods, preservatives, and the sampler's name. Sampling team members will maintain custody of the samples until they are relinquished to laboratory personnel or a professional courier service. The COC form will accompany the samples from the time of collection until receipt by the laboratory. Each party in possession of the samples will sign the COC form signifying receipt, except professional couriers. The COC form will be placed in a plastic bag and shipped with samples inside the cooler. After the samples, ice, and chain-of-custody forms are packed in the coolers, the cooler will be sealed with custody tape before it is relinquished to the courier. A copy of the original completed form will be provided by the laboratory along with the report of results. Upon receipt, the laboratory will inspect the condition of the seal and sample containers, and report the information on the COC forms.

3.3.1.3 Transfer of Custody and Shipment

Samples are accompanied by a COC record. When transferring samples, the individuals relinquishing and receiving the samples sign, date, and note the time on the record. This record documents custody transfer from the sampler, often through another person, to the analyst at the laboratory.

Samples are packaged properly for shipment and dispatched to the appropriate laboratory for analysis, with a separate COC record accompanying each shipping container (one for each field or stationary laboratory). Shipping containers will be sealed with custody seals for shipment to the laboratory. Courier names, and other pertinent information, are entered in the "Received by" section of the COC record.

Whenever samples are split with a facility owner or agency, it is noted in the remarks section of the COC record. The note indicates with whom the samples are being split, and is signed by both the sampler and recipient. If the split is refused, this will be noted and signed by both parties. If a representative is unavailable or refuses to sign, this is noted in the remarks section of the COC record. When appropriate, as in the case where the representative is unavailable, the COC record should contain a statement that the samples were delivered to the designated location at the designated time.

All shipments are accompanied by the COC record identifying its contents. The original record and yellow copy accompanies the shipment to the laboratory, and the pink copy is sent to be retained by the FTL.

3.3.1.4 Laboratory Custody Procedures

A designated sample custodian accepts custody of the shipped samples, and verifies that the packing-list sample numbers match those on the COC records. Pertinent information as to shipment, pickup, and courier is entered in the "Remarks" section. The custodian then monitors sample temperature and enters the sample numbers into a bound notebook, which is arranged by project code and station number.

The laboratory custodian uses the sample identification number or assigns a unique laboratory number to each sample, and is responsible for seeing that all samples are transferred to the proper analyst or stored in the appropriate secure area.

The custodian distributes samples to the appropriate analysts. Laboratory personnel are responsible for the care and custody of samples from the time they are received, until the sample is exhausted or returned to the custodian. The data from sample analyses are recorded on the laboratory report form.

When sample analyses and necessary QA checks have been completed in the laboratory, the unused portion of the sample will be disposed of properly. All identifying stickers, data sheets, and laboratory records are retained as part of the documentation. Sample containers and remaining samples are disposed of in compliance with all federal, state, and local regulatory requirements.

3.3.2 Custody Seals

When samples are shipped to the laboratory, they must be placed in containers sealed with custody seals. One or more custody seals must be placed on each side of the shipping container (cooler).

3.3.3 Field Notebooks

Typical field information to be entered in the field notebook is included in Section 5.10 of the companion FSP (ARCADIS, 2004b). In addition to COC records, a bound field notebook must be maintained by each FTL to provide a daily record of significant events, observations, and measurements during field investigations. All entries should be signed and dated. It should be kept as a permanent record.

These notebooks are intended to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project.

3.3.4 Corrections to Documentation

All original data recorded in field notebooks and COC records will be written with waterproof ink, unless prohibited by weather conditions. None of these accountable serialized documents are to be destroyed or thrown away, even if they are illegible or contain inaccuracies that require a replacement document.

If an error is made on an accountable document assigned to one team, the FTL may make corrections simply by drawing a single line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All subsequent corrections must be initialed and dated.

3.4 Analytical Methods Requirements

Project analytes, methods, and required detection levels have been listed in Table 2. The analyses for volatiles, semivolatiles, and metals will be per EPA methodology.

The analyses for other analytes in Table 2 will be per the data quality indicators provided in Appendix B.

For 1,2,3-trichloropropane the method and QA/QC, the laboratory will follow California State guidance to achieve the needed low regulatory limit of 0.005 micrograms per liter. Laboratory-specific SOPs will be defined subsequent to selection of the laboratory, and prior to start of work.

3.5 Quality Control Requirements

3.5.1 Field QC Procedures

QC requirements related to the sample collection process (i.e., design, methods, handling, and custody) requirements have been discussed in the previous sections of this document.

Field QC samples include field duplicates, field blanks (i.e., trip and rinsate blanks), and laboratory QC samples (for matrix spike/matrix spike duplicates). QC samples will be collected immediately following collection of target samples, using the same procedures as those used for collection of the target sample. The trip blanks will only be analyzed if contamination is found in field or equipment blanks. These procedures are presented in the accompanying FSP (ARCADIS, 2004b).

3.5.2 Laboratory Procedures

Laboratory QC procedures will include the following:

- Analytical methodology according to specific methods listed in Table 2;
- Instrument calibrations and standards as defined by EPA in SW-846, or other documents as appropriate;
- Laboratory blank measurements;
- Accuracy and precision measurements, at a minimum of 1 in 20, 1 per batch;
- Data reduction and reporting according to specific methods listed in Table 2; and
- Contract Laboratory Program (CLP)-type laboratory documentation.

The full CLP-type data package and validation will not be required for the screening (discrete) groundwater samples and investigation-derived waste (IDW) samples.

ARCADIS will be contracting the services of two laboratories to perform the sample analyses for this project. These laboratories are: Advanced Technology Laboratories

(ATL) of Signal Hill, CA for the analysis of depth-discrete water samples for VOCs (for screening purposes); and E-Max Laboratories of Torrance, CA (a CLP laboratory). The Acceptable Criteria for Instrument Calibration for both laboratories as well as the QAPP for E-max, will be forwarded to the EPA for review. Quality control limits for ATL have been attached at the end of their QAPP, included in Appendix B.

3.6 Instrument/Equipment Testing, Inspection, and Maintenance Requirements

Instrument maintenance logbooks are maintained in laboratories at all times. The logbooks, in general, contain a schedule of maintenance, as well as a complete history of past maintenance, both routine and non routine.

Preventive maintenance is performed according to the procedures described in the manufacturer's instrument manuals, including lubrication, source cleaning, detector cleaning, and the frequency of such maintenance. Chromatographic carrier gas-purification traps, injector liners, and injector septa are cleaned or replaced on a regular basis. Precision and accuracy data are examined for trends and excursions beyond control limits to determine evidence of instrument malfunction. Maintenance will be performed when an instrument begins to degrade as evidenced by the degradation of peak resolution, shift in calibration curves, decrease in sensitivity, or failure to meet one or another of the QC criteria.

Instrument downtime is minimized by keeping adequate supplies of all expendable items, where expendable means an expected lifetime of less than 1 year. These items include gas tanks, gasoline filters, syringes, septa, gas chromatography columns and packing, ferrules, printer paper and ribbons, pump oil, jet separators, open-split interfaces, and mass spectroscopy filaments.

Preventive maintenance for field equipment (e.g., pH meter) will be carried out in accordance with procedures and schedules outlined in the particular model's operation and maintenance manual.

3.7 Instrument Calibration and Frequency

The following subsections review instrument calibration and frequency information.

3.7.1 Field Calibration Procedures

For water analyses, field equipment requiring calibration includes: pH, electrical conductivity, temperature, dissolved oxygen and oxidation/reduction potential meters. These meters will be calibrated before the start of work and at the end of the sampling day. Any instrument "drift" from prior calibration should be recorded in a field notebook. Calibration will be in accordance with procedures and schedules outlined in the operations and maintenance manual for the particular instrument.

Calibrated equipment will be uniquely identified by using either the manufacturer's serial number or other means. A label with the identification number and the date when the next calibration is due will be physically attached to the equipment. If this is not possible, records traceable to the equipment will be readily available for reference. In addition, the results of calibrations and records of repairs will be recorded in a logbook.

Scheduled periodic calibration of testing equipment does not relieve field personnel of the responsibility of employing properly functioning equipment. If an individual suspects an equipment malfunction, the device must be removed from service, tagged so that it is not inadvertently used, and the appropriate personnel notified so that a recalibration or repair can be performed, or a substitute piece of equipment can be obtained.

Results of activities performed using equipment that has failed recalibration will be evaluated. If the activity results are adversely affected, the results of the evaluation will be documented and the TM and QA/QC reviewer will be notified.

3.7.2 Laboratory Calibration Procedures

Laboratory calibration procedures are specified in the referenced methods for all parameters listed in Table 2.

3.8 Data Acquisition Requirements (Nondirect Measurements)

Previously collected data and other information will be used to assist decision making during the RI. These data will be in both hard copy and electronic format. Electronic data will be handled by the electronic data management system described below.

3.9 Data Management

All data for all parameters will undergo two levels of review and validation: (1) at the laboratory, and (2) outside the laboratory as described in Section 5. Following receipt of validated data, it will be input into the project database to facilitate database inquiries and report preparation. The data will be stored in the databases with all laboratory qualifiers included. The database will be maintained in a manner that is compatible with, and provided to, EPA or others at EPA's request. Major components for complete data management will be as follows:

- **Data Conversion/Manipulation/Review.** Reports of data from sampling are received from the QAO in hardcopy or electronic format. These data must be converted, input, reviewed, and QC checked.

  In addition, available data from other sources may be incorporated into the database. These data will need to be manually input, output, reviewed, QC checked, then uploaded into the database.

- **Preparation of Tables.** Data tables will be prepared following receipt of validated data from the QAO following each sample event. Queries will be created for the database to generate updated tables.

- **Database Documentation.** An update of the database and complete documentation will be performed at the end of the project. The commands, file names, and general operating procedures for all the data queries will be documented.

4. Assessment/Oversight

Audit programs are established and directed by the QAO to ensure that field and laboratory activities are performed in compliance with project controlling documents. This section describes responsibilities and requirements and methods for scheduling, conducting, and documenting audits of field and laboratory activities.

4.1 Field Audits

Field audits focus on appropriateness of personnel assignments and expertise, availability of field equipment, adherence to project controlling documents for sample collection and identification, sample handling and transport, use of QC samples, COC procedures, equipment decontamination, and documentation. Field audits are not required, but may be performed in the event significant discrepancies are identified that warrant evaluation of field practices.

4.2 Laboratory Audits

Laboratory audits include reviews of sample-handling procedures, internal sample tracking, SOPs, analytical data documentation, QA/QC protocols, and data reporting. Selected offsite laboratories will be licensed by the State of California as a certified testing laboratory and will be NELAP accredited. If no previous audit has been conducted by ARCADIS, an audit may be conducted by the QAO during the course of this project to ensure the integrity of sample handling and processing by the laboratory.

4.3 Data Audits

Data audits will be performed on analytical results received from the laboratories. These audits will be accomplished through the process of data validation as described in Section 5, or may involve a more detailed review of laboratory analytical records. ARCADIS personnel, or a contracted laboratory data consultant, will perform a review of the data consistent with the level of effort described in the National Functional Guidelines. This level of validation consists of a detailed review of sample data, including verification of data calculations for calibration and quality control samples to assess if these data are consistent with method requirements. Upon request, the laboratory will make available all supporting documentation in a timely fashion.

4.4 Reports to Management and Responsibilities

Upon completion of any audit, the auditor will submit to the PM and FTL a report or memorandum describing any problems or deficiencies identified during the audit. It is the responsibility of the PM to determine if the deviations will result in any adverse effect on the project conclusions. If it is determined that corrective action is necessary, procedures outlined in Section 4.5 will be followed. The auditor will also debrief the laboratory or the field team at the end of the audit and request that the laboratory or field team comply with the corrective action request.

4.5 Corrective Actions

If QC audits result in detection of unacceptable conditions or data, the FTL will be responsible for developing and initiating corrective action. The PM will be notified if nonconformance is of program significance or requires special expertise not normally available to the project team. In such cases, the PM will decide whether any corrective action should be pursued. Corrective action may include the following:

- Reanalyzing samples if holding time criteria permit;
- Resampling and analyzing;
- Evaluating and amending sampling and analytical procedures; and
- Accepting data while acknowledging a level of uncertainty.

4.6 Reports to Management

A QA report will be prepared on the performance of sample collection and data quality. The report will include the following:

- Assessment of measurement data accuracy, precision, and completeness;
- Results of performance audits;
- Results of systems audits; and
- Significant QA problems and recommended solutions.

Monthly progress reports will summarize overall project activities and any problems encountered. QA reports generated on sample collection and data quality will focus on specific problems encountered and solutions implemented. Alternatively, in lieu of a separate QA report, sampling and field measurement data quality information may be summarized and included in the final reports summarizing field activities. The objectives, activities performed, overall results, sampling, and field measurement data quality information of the project will be summarized and included in the final field activities reports along with any QA reports.

5. Data Validation and Usability

5.1 Data Review, Validation and Verification Requirements

Chemical data will undergo two levels of review: (1) at the laboratory, and (2) outside the laboratory. ARACDIS QA personnel will perform a Level II review of all laboratory data. Ten percent of the laboratory data (from groundwater monitoring) will undergo a Level III review by Laboratory Data Consultants of Solana Beach, California.

Chemical data, with the exception of IDW data and discrete (screening) groundwater samples, will be reviewed outside the laboratory at the LOE described below. The IDW data may undergo a lower LOE if analyzed in separate analytical batches independent of the site samples.

A full data package (CLP-type) and validation will not be required for the discrete groundwater samples collected using a bailer. These samples are considered screening samples and will be used for selecting well-screen depth intervals; the CLP-type package and validation are not considered necessary. Furthermore, the decision will need to be made shortly after the analytical results become available to avoid standby time of the drill rig. The data cannot be validated in such a short timeframe.

An EPA Level II QC review, described below, may be modified during the review per ARCADIS' QAO, depending on available resources. Changes will be documented as amendments or technical memoranda to project files.

Data will be reviewed at EPA Level II and Level III. Ninety percent of the groundwater sample analytical batches will be reviewed for all the analytical parameters, detections and nondetections, at Level II. Also, 10 percent of the analytical batches for (post-installation groundwater monitoring) will be selected for Level III for all parameters, detections and nondetections. The analytical batches selected for Level III review will be selected at random, unless a new laboratory is performing the analyses. In this instance, the first analytical batch should undergo the Level III review as a proactive measure.

Level II review has been selected to provide for review of all the QA/QC summary forms in accordance with EPA CLP National Functional Guidelines for Inorganic/Organic Data review (to include all calibrations and internal standards) and flagging of the individual results, as opposed to review of a subset of the QC data as is the case for Level I review. Level II economizes the laboratory data review compared to Level III by limiting the review to QC summary data as opposed to raw data checks. Review of QC summary data that includes all QC parameters provides for the needed comprehensive coverage; this scope is covered under the Level II review.

The LOE detailed above is based on the objectives of this project and deals with quantitative evaluation of samples at trace levels for all analytes. The full database requires consistent flags for comparable and reproducible data, which should be met with this LOE. These levels of effort are appropriate because data are compared quantitatively to past data to establish quantitative trends, as well as compared to regulatory limits. Quantitative trends apply to all analytes, not just a subset of the target analytes. All analytes are contaminants of concern, even though, for example, TCE may be detected more frequently than other analytes. Establishing the validity of nondetect results is as important as the detected results for monitoring, thus both detection and nondetection results will be reviewed.

5.2 Validation and Verification Methods

Initial data reduction, validation, and reporting at the laboratory will be performed as described in the laboratory SOPs.

Independent data validation by ARCADIS or their designee will follow EPA *Contract Laboratory Program National Functional Guidelines for Inorganic/Organic Data Review* (EPA, 1994a, 1994b, 1999, and 2002a) as described above.

5.3 Reconciliation with DQOs

Results obtained from the project will be reconciled with the requirements specified in Table 2 of this QAPP. Assessment of data for precision, accuracy, and completeness will be per the following quantitative definitions.

5.3.1 Precision

If calculated from duplicate measurements:

$$RPD = \frac{(C_1 - C_2) \times 100\%}{(C_1 + C_2) / 2}$$

RPD	=	relative percent difference
C_1	=	larger of the two observed values
C_2	=	larger of the two observed values

If calculated from three or more replicates, use relative standard deviation (RSD) rather than RPD:

$$RSD = (s / \bar{y}) \times 100\%$$

RSD = relative standard deviation
s = standard deviation
$\bar{y}$ = mean of replicate analyses

Standard deviation, s, is defined as follows:

$$s = \sqrt{\sum_{i=1}^{n} \frac{(yi - \bar{y})^2}{n-1}}$$

s = standard deviation
yi = measured value of the ith replicate
$\bar{y}$ = mean of replicate analyses
n = number of replicates

5.3.2 Accuracy

For measurements where matrix spikes are used:

$$\%R = 100x \frac{S-U}{C_{sa}}$$

%R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration in unspiked aliquot
C_{sa} = actual concentration of spike added

For situations where a standard reference material (SRM) is used instead of or in addition to matrix spikes:

$$\%R = 100\% \text{ x } \left[\frac{C_m}{C_{sm}} \right]$$

%R = percent recovery
C_m = measured concentration of SRM
C_{sm} = actual concentration of SRM

5.3.3 Completeness (Statistical)

Defined as follows for all measurements:

$$\left[\frac{V}{T} \right]$$

$$\%C = 100\% \text{ x}$$

%C	=	percent completeness
V	=	number of measurements judged valid
T	=	total number of measurements

6. References

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Tables

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [1]	California DHS DLR (µg/L) [2]	Additional Regulatory Limits (µg/L)
TCL Volatile Organic Compounds (8260B)					
Acetone	Exceedances with respect				
Benzene	to federal and state drinking	1	CA Primary MCL [A]	0.5	0.15 [E]
Bromodichloromethane	water standards, and state	100	USEPA Primary MCL [C]	0.5	2.5 [I]; 100-proposed [A]
Bromoform	action levels.	100	USEPA Primary MCL [C]	0.5	45 [I]; 100-proposed [A]
Bromomethane	Evaluate water treatment	500	CA Proposition 65 Regulatory Level	0.5	
n-Butylbenzene	system design.	260	CA DHS State Action Level (F)		
sec-Butylbenzene	Evaluate remedial action	260	CA DHS State Action Level (F)		
Carbon disulfide	performance.	160	CA DHS State Action Level (F)		
Carbon tetrachloride		0.5	CA Primary MCL [A]	0.5	0.1 [E]
Chlorobenzene		100	USEPA Primary MCL [C]		50 [H]
Chloroethane		16	Other Taste and Odor [H]	0.5	100 [I]
Chloroform					
Chloromethane			No Applicable ARAR		
2-Chlorotoluene		140	CA DHS State Action Level (F)		
4-Chlorotoluene		140	CA DHS State Action Level (F)		
Cyclohexane					
Dibromomethane					
Dibromochloromethane					
Dibromochloropropane (DBCP)		0.2	USEPA Primary MCL [C]		0.05 [I]
1,2-Dibromoethane		0.05			0.1 [I]
1,2-Dichlorobenzene		600	CA DHS State Action Level (F)	0.5	600 [E]
1,3-Dichlorobenzene		600	CA DHS State Action Level (F)	0.5	600 [F]
1,4-Dichlorobenzene		5	CA Primary MCL [A]	0.5	6 [E]
Dichlorodifluoromethane		1,000	CA DHS State Action Level (F)		

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR (1)	California DHS DLR (µg/L) (2)	Additional Regulatory Limits (µg/L)
1,1-Dichloroethane	Exceedances with respect	5	CA Primary MCL (A)	0.5	3 (E)
1,2-Dichloroethane	to federal and state drinking	0.5	CA Primary MCL (A)	0.5	0.4 (E)
1,1-Dichloroethylene	water standards, and state	6	CA Primary MCL (A)	0.5	7 (C) ; 10 (E)
cis-1,2-Dichloroethylene	action levels.	6	CA Primary MCL (A)	0.5	70 (C)
trans-1,2-Dichloroethylene	Evaluate water treatment	10	CA Primary MCL (A)	0.5	100 (C)
Dichloromethane	system design.	5	CA/USEPA Primary MCL (A) (C)	0.5	4 (E)
(Methylene Chloride)	Evaluate remedial action				
1,2-Dichloropropane	performance.	5	CA/USEPA Primary MCL (A) (C)	0.5	0.5 (E)
2,2-Dichloropropane					
1,1-Dichloropropene					
1,3-Dichloropropene		0.5	CA Primary MCL (A)		
cis-1,3-Dichloropropene		0.5	CA Primary MCL (A)	0.5	0.2 (E)
trans-1,3-Dichloropropene		0.5	CA Primary MCL (A)	0.5	0.2 (E)
Ethane					
Ethene					
Ethybenzene		300	CA Primary MCL (A)	0.5	700 (C); 300 (E) ; 29 (H)
Hexachlorobutadiene					
2-Hexanone					
Isopropylbenzene (Cumene)		770	CA DHS State Action Level (F)	0.5	
Methane					
Methyl acetate					
Methyl ethyl ketone		8400	Other Taste and Odor (H)	5	
Methyl isobutyl ketone (MIBK)		120	CA DHS State Action Level (F)		1300 (H)
Methylcyclohexane					
Napthalene		170	CA DHS State Action Level (F)		
n-Propylbenzene		260	CA DHS State Action Level (F)		

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [(1)]	California DHS DLR (µg/L) [(2)]	Additional Regulatory Limits (µg/L)
Styrene	Exceedances with respect	100	CA/USEPA Primary MCL [(A) (C)]	0.5	11 [(H)]
1,1,2,2-Tetrachloroethane	to federal and state drinking	1	CA Primary MCL [(A)]	0.1	0.5 [(E)]; 1.5 [(I)]
Tetrachloroethylene (PCE)	water standards, and state	5	CA/USEPA Primary MCL [(A) (C)]	0.5	0.06 [(E)]
Toluene	action levels.	150	CA Primary MCL [(A)]	0.5	42 [(H)]; 1,000 [(C)]
1,2,3-Trichlorobenzene	Evaluate water treatment				
1,2,4-Trichlorobenzene	system design.	5	CA Primary MCL [(A)]/CA PHG [(E)]	0.5	70 [(C)]
1,1,1-Trichloroethane (1,1,1-TCA)	Evaluate remedial action performance.	200	CA/USEPA Primary MCL [(A) (C)]	0.5	
1,1,2-Trichloroethane		5	CA/USEPA Primary MCL [(A) (C)]	0.5	5 [(I)]
Trichloroethylene (TCE)		5	CA/USEPA Primary MCL [(A) (C)]	0.5	0.8 [(E)]
Trichlorofluoromethane		150	CA Primary MCL [(A)]	5	700 [(E)]
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)		1,200	CA Primary MCL [(A)]	10	4,000 [(E)]
1,2,4-Trimethylbenzene		330	CA DHS State Action Level (F)		
1,3,5-Trimethylbenzene		330	CA DHS State Action Level (F)		
Vinyl chloride		0.5	CA Primary MCL [(A)]	0.5	0.05 [(E)]; 2 [(C)]
Xylene(s)		1,750	CA Primary MCL [(A)]	1,800	17 [(H)]; 10,000 [(C)]
Additional Volatiles	Exceedances with respect				
Methyl tert-butyl ether (MTBE)	to federal and state drinking water standards, and state action levels.	13	CA Secondary MCL [(B)]	3	13 [(E)]

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [1]	California DHS DLR (µg/L) [2]	Additional Regulatory Limits (µg/L)
TCL Semivolatile Organic Compounds					
Acenaphthene	Exceedances with respect to federal and state drinking water standards, and state action levels. Evaluate water treatment system design. Evaluate remedial action performance.				
Acenaphthylene					
Acetophenone					
Aniline (Phenylamine) (Aminobenzene)					
Anthracene					
Benzaldehyde					
Benzoic Acid (Carboxybenzene)					
Benzo(a)anthracene					
Benzo(a)pyrene		0.2	CA/USEPA Primary MCL [A] [C]	0.1	0.004 [E]
Benzo(b)fluoranthene					
Benzo(g,h,i)perylene					
Benzo(k)fluoranthene					
Benzyl Alcohol (Phenylmethanol)					
1,1'-Biphenyl					
Bis(2-chloroehoxy)methane					
Bis(2-chloroethyl)ether					
Bis(2-chloroisopropyl)ether					
4-Bromophenyl-phenyl ether					
Butylbenzyl phthalate (BBP)					
Caprolactam					
Carbazole					
4-Chloro-3-methylphenol					
4-Chloroaniline					

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [1]	California DHS DLR (µg/L) [2]	Additional Regulatory Limits (µg/L)
2-Chloronaphthalene	Exceedances with respect to federal and state drinking water standards, and state action levels.				
2-Chlorophenol					
4-Chlorophenyl-phenyl ether					
Chrysene					
Di(2-ethylhexyl)adipate	Evaluate water treatment system design.	400	CA/USEPA Primary MCL [(A) (C)]	5	200 [(E)]
Di(2-ethylhexyl)phthalate		4	CA Primary MCL [(A)]	3	6 [(C)]; 12 [(E)]
dibenz(a,h)anthracene	Evaluate remedial action performance.				
Dibenzofuran (Diphenylene oxide)					
3,3'-Dichlorobenzidine					
2,4-Dichlorobenzidine					
2,4-Dichlorophenol					
Diethyl phthalate (DEP)					
Dimethyl phthalate					
2,4-Dimethylphenol		100	CA DHS State Action Level (F)		
4.6-Dinitro-2-methylphenol					
2,4-Dinitrophenol					
2,4-Dinitrotoluene					
2,6-Dinitrotoluene					
Di-n-butylphthalate (Dibutyl phthalate)					
Endothall		100	CA/USEPA Primary MCL [(A) (C)]	45	580 [(E)]
Fluoranthene (Idryl)					
Fluorene					
Glyphosate		700	CA/USEPA Primary MCL [(A) (C)]	25	1000 [(E)]
Hexachlorobenzene		1	CA/USEPA Primary MCL [(A) (C)]	0.5	0.03 [(E)]

Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [(1)]	California DHS DLR (µg/L) [(2)]	Additional Regulatory Limits (µg/L)
Hexachlorocyclopentadiene	Exceedances with respect	50	CA/USEPA Primary MCL [(A) (C)]	1	50 [(E)]
Hexachloroethane	to federal and state drinking				
Indeno(1,2,3-cd)pyrene	water standards, and state				
Isophorone	action levels.				
2-Methylnaphthalene	Evaluate water treatment				
2-Methylphenol	system design.				
4-Methylphenol	Evaluate remedial action				
3,4-Methylphenol	performance.				
2-Nitroaniline	↓				
3-Nitroaniline					
4-Nitroaniline					
4-Nitrophenol					
Pentachlorophenol		1	CA/USEPA Primary MCL [(A) (C)]	0.2	0.4 [(E)]
Phenanthrene					
Phenol		4,200	CA DHS State Action Level (F)		
Pyrene					
Pyridine					
2,4,6-Trichlorophenol					
2,4,5-Trichlorophenol					
Emergent Compunds	Exceedances with respect				
1,4-Dioxane	to federal and state drinking	3	CA DHS State Action Level (F)		15 [(I)]
N-Nitrosodimethylamine (NDMA)	water standards, and state action levels.	0.01	CA DHS State Action Level (F)		0.02 [(I)]
1,2,3-Trichloropropane (1,2,3-TCP)	Evaluate water treatment system design.	0.005	CA DHS State Action Level (F)		

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Table 1. Data Needs and Uses
Omega Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR (1)	California DHS DLR (µg/L) (2)	Additional Regulatory Limits (µg/L)
Treatment/Discharge Parameters					
Total Organic Parameters Total Organic Carbon Biological Oxygen Demand Chemical Oxygen Demand	Evaluate groundwater treatment alternatives. Evaluate treated groundwater discharge alternatives.				

Notes:

(1) ARARs from June 2003 California EPA Compilation of Water Quality Goals and Updates through September 2003.

(2) California Department of Health Services required Detection Limit for Purposes of Reporting (DLR).

(3) Calculated ARAR based on hardness = 120 mg/L as CaCO3

(A) California Department of Health Services Primary MCL for Drinking Water.

(B) California Department of Health Services Secondary MCL for Drinking Water.

(C) USEPA Primary MCL for Drinking Water.

(D) USEPA Secondary MCL for Drinking Water.

(E) California Office of Environmental Health Hazard Assessment Public Health Goal for Drinking Water.

(F) California Department of Health Services State Action Level for Toxicity.

(G) California Department of Health Services State Action Level for Taste and Odor.

(H) Other Taste and Odor Thresholds.

(I) California Proposition 65 Regulatory Level for Drinking Water.

Table 1. Data Needs and Uses
Omega Chemical Operable Uit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR (1)	California DHS DLR (µg/L) (2)	Additional Regulatory Limits (µg/L)
Emergent Compounds					
Chromium (VI)	Exceedances with respect	11(0.2) [4]	California Toxics Rule for Aquatic Life Protection (H)	0.5	0.4 (E)
Perchlorate	to federal and state drinking	4	CA DHS State Action Level (F)	0.5	7 (C); 10 (E)
	water standards, and state			0.5	70 (C)
	action levels.			0.5	100 (C)
	Evaluate water treatment			0.5	4 (E)
	system design.				
TAL Inorganics				0.5	0.5 (E)
Aluminum	Exceedances with respect	50	USEPA Secondary MCL (D) 11		
Antimony	to federal and state drinking	6	CA/USEPA Primary MCL (A) (C)		
Arsenic	water standards, and state	10	USEPA Primary MCL (C)		
Barium	action levels.	1,000	CA Primary MCL (A)	0.5	0.2 (E)
Beryllium	Evaluate groundwater	4	CA/USEPA Primary MCL (A) (C)	0.5	0.2 (E)
Cadmium	treatment alternatives and	5	CA/USEPA Primary MCL (A) (C)		
Calcium	treated groundwater				
Chromium (total)	discharge options.	50	CA Primary MCL (A)	0.5	700 (C); 300 (E); 29 (H)
Cobalt					
Copper		11 [2]	California Toxics Rule for Aquatic Life Protection (H)		
Iron		300	USEPA Secondary MCL (D) 11	0.5	
Lead		3.1	California Toxics Rule for Aquatic Life Protection (H)		
Magnesium					
Manganese		50	CA/USEPA Secondary MCL (B) (D)	5	
Mercury		2	CA/USEPA Primary MCL (A) (C)		1300 (H)
Molybdenum					
Nickel		61	California Toxics Rule for Aquatic Life Protection (H)		
Potassium					
Selenium		5	California Toxics Rule for Aquatic Life Protection (H)		

Table 1. Data Needs and Uses
Omegal Chemical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR (1)	California DHS DLR (µg/L) (2)	Additional Regulatory Limits (µg/L)
Silver	Exceedances with respect to federal and state drinking water standards, and state action levels.	4.7 (2)	California Toxics Rule for Aquatic Life Protection (H)	10	100 (B) (D)
Sodium					
Thalium		2	CA/USEPA Primary MCL (A) (C)	1	0.1 (E)
Vanadium		50	CA DHS State Action Level (F)	3 (preliminary)	
Zinc	Evaluate groundwater treatment alternatives and treated groundwater discharge options.	140 (2)	California Toxics Rule for Aquatic Life Protection (H)	50	5000 (B) (D)
Cyanide		5.2	California Toxics Rule for Aquatic Life Protection (H)	100	200 (C); 150 (E)
Additional Inorganics					
Boron	Evaluate groundwater treatment alternatives and treated groundwater discharge options.	1,000	CA DHS State Action Level (F)		
Silicon					
Treatment/Discharge Parameters					
pH	Evaluate groundwater treatment alternatives and treated groundwater discharge options.	6.5 to 8.5	USEPA Secondary MCL (D)		
Alkalinity					
Ammonia		500	Other Taste and Odor (H)		
Bicarbonate					
Bromide	Exceedances with respect to federal and state drinking water standards, and state action levels.				
Chloride		250,000	CA/USEPA Secondary MCL (B) (D)		
Fluoride		1,000	CA PHG (E)	100	2000 (A) (D)
Nitrate (as N)		10,000	USEPA Primary MCL (C)		10000 (E)
Nitrite (as N)	↓	1,000	CA/USEPA Primary MCL (A) (C)	400	1000 (E)
Phosphorus (orthophosphate, total phosphorus)					
Sulfate		250,000	CA Secondary MCL (B)	500	250,000 (D)

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Table 1. Data Needs and Uses
Omegal Cheical Operable Unit 2, Whittier, California

Compound	Uses/Decisions	Applicable Regulatory Limit (µg/L)	Applicable ARAR [(1)]	California DHS DLR (µg/L) [(2)]	Additional Regulatory Limits (µg/L)
Total dissolved solids (TDS)	Evaluate groundwater treatment alternatives and treated groundwater discharge options. Exceedances with respect to federal and state drinking water standards, and state action levels.	250,000	CA/USEPA Secondary MCL [(B) (D)]		

Notes:

(1) ARARs from June 2003 California EPA Compilation of Water Quality Goals and Updates through September 2003.
(2) Calculated ARAR based on hardness = 120 mg/L as CaCO3
(3) California Department of Health Services required Detection Limit for Purposes of Reporting (DLR).
(4) 0.2 µg/L detection level is needed for comparability to other databases in the region per previous DHS limit.
(A) California Department of Health Services Primary MCL for Drinking Water.
(B) California Department of Health Services Secondary MCL for Drinking Water.
(C) USEPA Primary MCL for Drinking Water.
(D) USEPA Secondary MCL for Drinking Water.
(E) California Office of Environmental Health Hazard Assessment Public Health Goal for Drinking Water.
(F) California Department of Health Services State Action Level for Toxicity.
(G) California Proposition 65 Regulatory Level for Drinking Water
(H) California Toxics Rule for Freshwater Aquatic Life Protection - Continuous (4-day average) Concentration.
(I) California Toxics Rule for Freshwater Aquatic Life Protection - Maximum (1-hr average) Concentration
(J) Other Taste and Odor Thresholds

Table 2. Measurement Performance Criteria
Omega Chemical Operable Unit 2, Whittier, California

Parameter	Method	Target Detection Limit	Analytical Accuracy (%Recovery)	Analytical Precision (Relative % Deviation)	Overall Completeness (%)
Volatile Organic Compounds					
TCL Volatile Organic Compounds (VOCs) plus MTBE [a]	EPA 8260B	(c)	70-130/CLP	±30	90
TCL [a] Semivolatile Organic Compounds (SVOCs)	CLP [b]	(c)	CLP		
Emergent Compounds					
1,4-Dioxane	EPA 8720 [b]	1 µg/L	40-130	±30	90
NDMA	Modified EPA Method 1625 [b]	0.02 µg/L	50-125	±30	90
Perchlorate	EPA 314 [b,d]	5 µg/L	50-150	±50	90
Hexavalent Chromium	EPA 218.6 [b,d]	0.2 µg/L	70-140	±30	90
1,2,3 TCP	8260SIM, 8270C, 504.1, or 551.1[i]	0.005 µg/L	(i)	(i)	90
Groundwater Treatment and Discharge Parameters					
TAL [a] Metals (field filtered) plus Boron, Silicon	EPA 314 [b,d] EPA 200.8 [d,b] EPA 245.1/CLP		70-130	±30	90
Cyanide	EPA 335.4 [d,b]	10 mg/L	75-125	±25	90
Bromide	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Chloride	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Fluoride	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Nitrate-N	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Nitrite-N	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Orthophosphate-P	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Total Sulfate	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Total Kjeldahl Nitrogen (TKN)	EPA 351.2 [d,b]	1.0 mg/L	75-125	±25	90
Ammonia	EPA 350.2 [d,b]	0.3 mg/L	75-125	±25	90
Total Phosphorus	EPA 365.4 [d,b]	0.3 mg/L	75-125	±25	90
Total Dissolved Solids (TDS)	EPA 160.1 [d,b]	20 mg/L	75-125	±25	90
Alkalinity	SM 2320B [b,e]	20 mg/L	75-125	±25	90
Total Organic Carbon	EPA 415.1 [d]	2.0 mg/L	75-125	±30	90

Table 2. Measurement Performance Criteria
Omega Chemical Operable Unit 2, Whittier, California

Parameter	Method	Target Detection Limit	Analytical Accuracy (%Recovery)	Analytical Precision (Relative % Deviation)	Overall Completeness (%)
BOD	SM 5210B [e]	3mg/L	75-125	±25	90
COD	SM 5220D [e]	5.0 mg/L	75-125	±30	90
Field Analysis for Volatile Organics	(i)	(j)	(j)	(j)	90

[a] Target Compound List (TCL) and Target Analyte List (TAL) as shown in Table A-1 and Appendix B. MTBE: methyl tert butyl ether.

[b] Volatile organics, semivolatile organics, metals and cyanide may be analyzed by SW 896 Procedures, depending on availability.

[c] For volatile organics, detection limits will be at 1 part per billion (ppb) for all except 0.5 ppb for vinyl chloride, carbon tetrachloride, 1,2 dichloroethane, cis and trans-1,3-dichloropropene, and 2 ppb for 1,2-dibromo-3-chloropropene.

[d] U.S. Environmental protection Agency, 1979. *Methods for Chemical Analysis of Water and Wastes*, EPA-600/4-79-020, revised March 1983; U.S. Environmental Protection Agency, *Test Methods for Evaluating Solid* Waste, SW846.

[e] *Standard Methods for the Examination of Water and Wastewater*, 17th Edition (1989).

[f] State of California Department of Health Services (DHS) method Determination of Perchlorate by Ion chromatography.

[g] Silica to be determined as silica by EPA 200.7 with a detection limit of <01 ppm.

[h] Target detection level is reporting level, see text for explanation.

[i] The method and QA/QC will follow California State guidance to achieve the needed low regulatory limit. Laboratory-specific standard operating procedures will be defined prior to start of work, and subsequent to selection of laboratory.

[l] Volatile organics to be analyzed in the field will be the same list as the offsite laboratory analyses (a), target detection levels will also be equivalent to the offsite laboratory analyses. Method will be based on 8260/GC/MS. Method and field laboratory-specific standard operating procedures will be defined prior to start of work.

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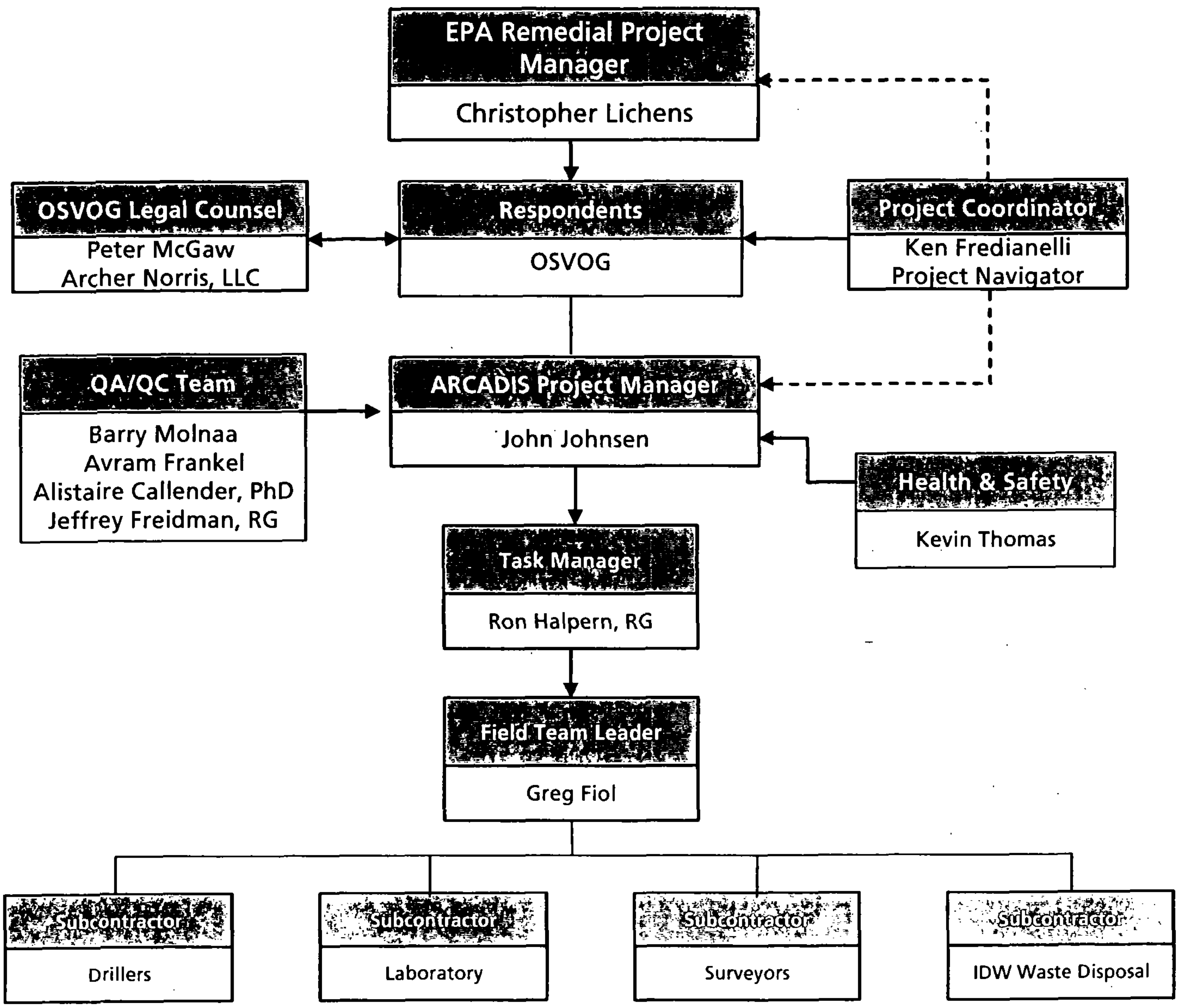
Figures



Area Manager: K. THOMAS Project Director: J. FRIEDMAN Task Manager: R. HALPERN Technical Review: R. HALPERN	ARCADIS Arcadis of Los Angeles 1400 N. Harbor Boulevard, Suite 700 Fullerton, CA 92835-4127 Tel: 714-278-0992 Fax: 714-278-0051 www.arcadis-us.com	PROJECT TEAM REMEDIAL INVESTIGATION WHITTIER, CALIFORNIA	Project Number: CA646.01.01 Drawing Date: 11/12/04 Figure: 1

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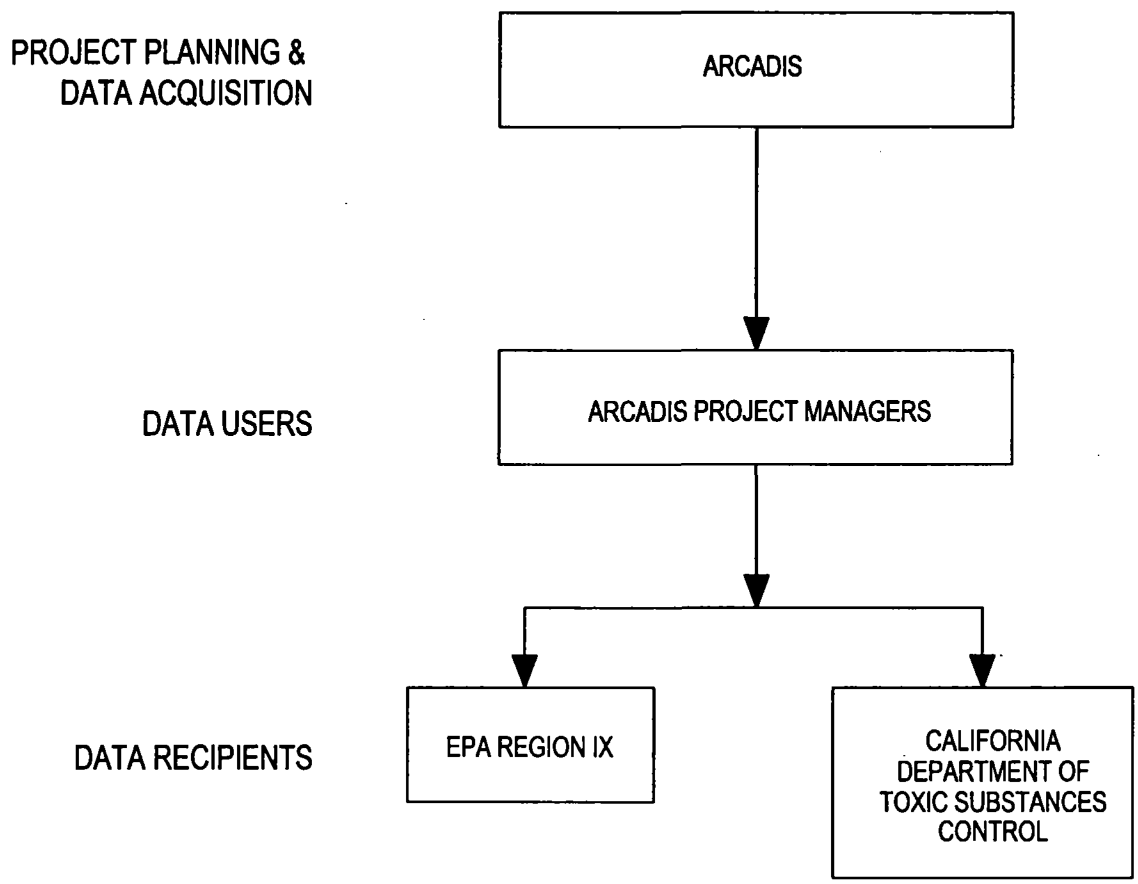

Area Manager K. THOMAS	ARCADIS	DATA USERS/RECIPIENTS RI/FS FIELD ACTIVITIES	Project Number CA646.01.01
Project Director J. FRIEDMAN			Drawing Date 11/12/04
Task Manager R. HALPERN	Arcadis of Los Angeles 1400 N. Harbor Boulevard, Suite 700 Fullerton, CA 92835-4127 Tel: 714-278-0992 Fax: 714-278-0051 www.arcadis-us.com	REMEDIAL INVESTIGATION WHITTIER, CALIFORNIA	Figure 2
Technical Review R. HALPERN			

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SOURCE: CHRM HILL, INC. FIGURE 1-1 SITE LOCATION MAP

Area Manager K. THOMAS	ARCADIS	SITE LOCATION MAP	Project Number CA646.01.01
Project Director J. FRIEDMAN			Drawing Date 9/7/04
Task Manager R. HALPERN	Arcadis of Los Angeles 1400 N. Harbor Boulevard, Suite 700 Fullerton, CA 92835-4127 Tel: 714-278-0992 Fax: 714-278-0051 www.arcadis-us.com	OMEGA CHEMICAL SUPERFUND SITE WHITTIER, CALIFORNIA	Figure 3
Technical Review R. HALPERN			

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Appendix A

Data Quality Objectives

Data Quality Objectives (DQOs)
Well Construction and Groundwater Sampling
Remedial Investigation
Omega Chemical Superfund Site – Operable Unit 2

Step 1. State the Problem

1) *Identify the members of the planning team* – The members of the planning team include the Environmental Protection Agency (EPA) Remedial Project Manager (RPM), the Project Coordinator (PC), ARCADIS' Project Manager (PM), ARCADIS's Task Manager (TM), and ARCADIS's Quality Assurance Officer (QAO).

2) *Identify the primary decision maker* – There will not be a primary decision maker. Decisions will be made by consensus.

3) *Develop a concise description of the problem* – The Omega Chemical Corporation (Omega) is a former refrigerant/solvent recycling operation located in Whittier, California. A series of soil gas, soil and groundwater investigations have been performed at the former Omega Chemical Facility (a.k.a. Operable Unit 1 [OU-1]) by a variety of consultants beginning in 1985. Chlorinated hydrocarbons, primarily PCE, TCE, 1,1-DCE, cis-1,2-DCE and chloroform, and Freons (Freon 11 and Freon 113) were identified as the primary chemicals of concern directly beneath the Omega site. Existing groundwater and soil data indicate that elevated concentrations of volatile organic compounds (VOCs) and other compounds are present in the soil and groundwater beneath the OU-1. A plume of VOCs in shallow groundwater extends approximately 2 miles from the Omega site to the southwest. The groundwater plume extending downgradient from OU-1 has been termed "Operable Unit 2 (OU-2)". Although the former Omega facility is located at the head of the plume, and is likely a contributing source of the plume, the distribution of some contaminants suggests there may be one or more additional sources contributing to the plume.

   The primary objective of this investigation is estimate the vertical and lateral extent of groundwater contamination known as OU-2.

   EPA has conducted a record search that indicated industrial facilities other than Omega likely contributed to groundwater contamination within OU-2. The current understanding is that the groundwater contamination present at OU-2 is a continuous, co-mingled plume originating from multiple source areas. This investigation will assess the continuity of groundwater contamination at OU-2 and characterize the main source areas of the contamination. Many of these facilities are currently under a regulatory oversight and the extent of contamination has been addressed by remedial investigation. As part of the Omega investigation, reports on these sites maintained at the Los Angeles Regional Water Quality Control Board (LARWQCB) and the Department of Toxic Substances Control (DTSC) will be reviewed (by EPA) and the information complied and evaluated.

The problem, tasked by the UAO, is summarized as follows:

a) The vertical and lateral extent, as well as the nature of contamination in groundwater beneath OU-2 needs to be determined. The trend in contaminant concentration in groundwater needs to be evaluated. The EPA has tasked the Omega Small Volume Group (OSVOG) with installing 11 groundwater monitoring wells and one extraction well within and on the perceived outer edges of the plume to accomplish this task.

b) The risk to human health and the environment from contaminants present at OU-2 needs to be assessed. The UAO Scope of Work indicated this task will be performed by the EPA.

c) The presence, extent, and concentrations of emergent contaminants (1,4-dioxane, perchlorate, NDMA, hexavalent chromium, and 1,2,3-trichloropropane [1,2,3-TCP]) in groundwater surrounding and downgradient of the Omega site needs to be determined. This task will be accomplished by groundwater monitoring of the new wells installed. EPA has directed OSVOG to perform one round of groundwater monitoring at the OU-2.

d) The remedial action best suited to site conditions needs to be selected to restore the aquifer, prevent the contamination of nearby drinking wells, prevent ongoing contamination migration, and prevent exposure to humans and the environment. This task has as yet to be assigned.

e) Investigation-derived waste (IDW) generated during field activities (e.g., drill cuttings, well development water, well purge water) will need to be properly disposed of in accordance with state, federal, and local regulations.

4) *Specify available resources and relevant deadlines for the study* – Although not complete, investigations have been performed previously at the Omega site. The site history, past investigations, and remediation activities are discussed in detail in the Final On-Site RI/FS Work Plan (Camp Dresser & McKee [CDM], 2003) and the Omega Chemical Superfund Site; Whittier, California: Phase 2 Groundwater Characterization Study Report (Weston Solutions, Inc. [Weston], 2003).

Data obtained in 1988 from site assessment activities, including groundwater and soil sampling conducted by the site owner/operator, Dennis O'Meara, and data from a preliminary assessment conducted by EPA in January 1995, indicated the presence of hazardous substances in subsurface soil and groundwater at the site, including methylene chloride, PCE, and TCE. The presence of these substances and deteriorated underground storage tanks at Omega lead EPA to determine that an imminent and substantial endangerment requiring a removal action existed at Omega. On May 3, 1995 EPA issued an Action Memorandum authorizing a Removal Action involving the following response actions:

- Securing the site;
- Sampling and categorizing hazardous materials;
- Removing hazardous substances and grossly contaminated equipment, structures and debris;
- Sampling surface and subsurface soils and groundwater to determine the nature and extent of contamination;
- Disposing, stabilizing, or treating grossly contaminated soils;
- Grading, capping, and fencing contaminated soil areas.

EPA has divided the Omega Chemical Superfund Site into two operable units: OU-1 and OU-2. OU-1 includes the Omega Chemical facility property and extends a short distance west-southwest to Putnam Street (Weston, 2003). OU-2 surrounds the OU-1 and extends offsite approximately 2.2 miles to the southwest. This DQO describes work to be completed within the OU-2.

As part of the OU-1 effort, EPA entered into a Partial Consent Decree with the potentially responsible parties (PRPs) who had agreed to complete work at the site. This group is known collectively as the Omega PRP Organized Group (OPOG). This Partial Consent Decree was entered into the District Court on February 23, 2001. OPOG agreed to perform a RI/FS, conduct a Non-Time Critical Removal Action, perform a risk assessment, and install groundwater monitoring wells at OU-1, also referred to as the Phase 1A area.

As part of the OU-2 effort, EPA issued an order to another group of PRPs (the Omega Small Volume Group (OSVOG) to complete work at the OU-2, and initiated settlement negotiations with the remaining PRPs.

A record search conducted by EPA revealed ongoing remedial activities at multiple facilities within OU-2. Relevant reports and other documents are available at the LARWQCB and DTSC.

A local water supply well is impacted and continues to be threatened, although it is not known at this time whether the contamination originated at Omega. If no action is taken, drinking water aquifers may become impaired. The OU-2 RI tasks assigned to OSVOG in the latest UAO is scheduled to be completed mid 2005. Additional feasibility studies will be performed by EPA and are likely to be completed in 2006.

Step 2. Identify the Decision

1) *Identify the principal study question –*

The apparent problem at the site is the migration to groundwater of chlorinated solvents and associated attenuation products, and potentially of other compounds. The current decision requires adequate data for use in plume delineation, contamination forensic evaluation, assessment of human health and ecological risk, and recommending a remedial action. The concentrations of these VOC and attenuation compounds are greater than background levels for the area and exceed health-based benchmarks in the vicinity of the site. The principal goals for CH2M HILL are to develop a sufficient amount of data to support selection of an appropriate approach for the site remediation and develop a well-supported Record of Decision (ROD). Achieving these goals includes answering the following study questions:

a) What is the vertical and lateral extent and nature of contamination in groundwater beneath OU-2, and what is the trend in groundwater concentrations?

b) Do contaminants pose an unacceptable potential risk to human health and the environment?

c) Are emergent contaminants (1,4-dioxane, perchlorate, NDMA, hexavalent chromium, and 1,2,3-TCP) present in groundwater surrounding and downgradientof the Omega site?

d) What remedial action will best suit the site conditions to restore the aquifer, prevent the contamination of nearby drinking water wells, prevent ongoing contamination migration, and prevent exposure to humans and the environment?

e) How can IDW (e.g., drill cuttings, well development water, well purge water, and aquifer testing water) be properly disposed in accordance with state, federal, and local regulations?

2) *Define alternate actions that could result from resolution of the principal study question* –The alternate actions for goals defined in (1) above will be, respectively:

a) (1) The nature and extent of groundwater contamination will be based on existing information, including groundwater samples from past cone penetrometer test (CPT) investigations and a limited number of existing monitoring wells. Uncertainties regarding the extent of the plume will remain and changes in concentrations within areas previously characterized by in-situ samples will not be assessed.

(2) Additional well clusters will be installed and monitored at locations within the plume with no permanent monitoring wells at downgradient and lateral edges of the plume to characterize the lateral and vertical extent of contamination. These wells will be available for future monitoring to evaluate changes in contaminant concentrations in groundwater.

b) (1) Additional data collection indicates that there is a risk to human health, (2) no risk, or (3) insufficient data.

c) (1) If emergent chemicals are not present in groundwater, then commonly used technologies for groundwater treatment will be utilized. (2) If emergent chemicals are present, then additional groundwater treatment will be required.

d) Remedial actions that may be considered include no action, natural attenuation, groundwater extraction and treatment system. The site conditions and treatment requirements may require collection of additional data or information to select a remedial action that will best suit the site conditions.

e) Drill cuttings may be disposed as (1) nonhazardous soil in a Class II landfill, or (2) hazardous waste in a Class I landfill. IDW water can be disposed as clean water to a storm drain if no contaminants exceeding maximum contaminant levels (MCLs) or Action Levels (ALs) are present. Wastewater containing contaminants above ALs or MCLs must be treated onsite or disposed at a treatment, storage, and disposal facility (TSDF).

3) Combine the principal study question and the alternative actions into a decision statement –

a) If the new understanding of the nature and extent of groundwater contamination is shown to be significantly different than the current understanding, then a different remedial approach may need to be considered. If the new data are not sufficient to adequately characterize the nature and extent of the contamination, then additional wells will be installed and/or the duration of monitoring extended.

b) If the contaminants at OU-2 pose an unacceptable potential risk to human health and the environment, a remedial action will be recommended. No action will be recommended otherwise. A recommendation for collection of additional data will be made if the risk cannot be fully assessed based on the data collected.

c) If emergent contaminants are present, additional treatment technologies for groundwater may be required.

d) If the selection of a remedial action that will best suit the site conditions cannot be made based on the data available, additional data or information will be collected.

e) IDW water will be treated onsite and discharged as clean if onsite treatment is feasible. If IDW water cannot be treated onsite, it will be disposed at a TSDF. If drill cuttings have not met nonhazardous waste criteria, they will need to be placed in a Class I landfill. If drill cuttings have met nonhazardous waste criteria, they will be placed in a Class II landfill.

4) *Organize multiple decisions* – Based on the answers to the principal study questions, decisions about alternate actions and additional phases of RI/FS activities will be made during the progress of the RI/FS. The resolution of 3(b) and 3(c) may impact 3(a) by requiring that additional data or information be collected.

a) The updated assessment of the nature and extent of contamination may indicate that the VOC plume has migrated further downgradient or to a greater depth than is currently expected. If so, it may result in the need for additional monitoring wells and extended groundwater monitoring.

b) If a risk of exposure is determined to exceed human health or ecological criteria, then a remedial action to reduce that risk to an acceptable level will be recommended.

c) The presence of emerging contaminants in groundwater may necessitate additional site characterization and groundwater treatment technology.

d) If IDW water can be treated onsite, it will be discharged as clean. If IDW water cannot be treated onsite, it will be disposed at a TSDF. If drill cuttings have not met nonhazardous waste criteria, they will need to be placed in a Class I landfill. If drill cuttings have met nonhazardous waste criteria, they will be placed in a Class II landfill. The range of IDW disposal options was presented and the associated waste profiling specified; evaluation of other disposal options is not required.

Step 3. Identify Inputs to the Decision

The purpose of this step is to identify the information and measurements needed to support the decision statement. The data will be evaluated with regard to the four principal questions of the RI/FS.

1) *Identify the information that will be required to resolve the decision statement* – Based on data uses and availability, the following data are needed:

a) To resolve the decision statement, the planning team will need contaminant concentration data for groundwater samples from new and existing monitoring wells, and hydrogeological data (including historical) from existing wells, as well as applicable regulatory criteria for the following constituents: VOCs, semivolatile organic compounds (SVOCs), metals, perchlorate, and hexavalent chromium.

b) To resolve the decision statement (b), the planning team will need groundwater and soil concentrations of contaminants listed under (a) and (c), appropriate human health risk and ecological risk criteria, information on exposure pathways, and exposure information.

c) To resolve the decision statement (c), the planning team will need the analytical results for emerging contaminants (1,4-dioxane; perchlorate; NDMA; 1,2,3-TCP; hexavalent chromium) from site monitoring wells as well as applicable regulatory criteria.

d) To resolve the decision statement (d), aquifer hydraulic characteristics derived from aquifer testing will be used to provide information critical to assess contaminant fate and transport and evaluate remediation alternatives. Groundwater elevations and contaminant concentrations in groundwater will be measured to define groundwater flow direction, allow plume tracking over time, and provide calibration data for the numerical model to assess contaminant fate and transport and evaluate remedial alternatives. Analytical results for groundwater samples, including compounds listed under (a) and (c), and additional compounds (nitrate, sulfate, methane, total dissolved solids [TDS], biological oxygen demand [BOD], chemical oxygen demand [COD], pH) will be used to select the treatment technology. Hydraulic conductivity, soil moisture, redox potential, cation exchange capacity, and total organic carbon (TOC) will be used to evaluate contaminant fate and transport.

e) To resolve the decision statement (e), the planning team will need the analytical results for the IDW, both soil cuttings and groundwater, as well as applicable regulatory action levels and screening criteria.

2) *Determine the sources for each item of information identified:* The results from this investigation will provide the necessary information to resolve the decision statement. Data from previous site investigations will be utilized as needed.

a) Lithologic and laboratory analytical data from samples collected at new and existing monitoring wells.

b) Soil and groundwater analytical data collected during this and previous investigations as well as information on exposure pathways.

c) Laboratory analyses of emerging compounds from groundwater samples collected from the new and existing wells.

d) Data collected under (a), (b), and (c), aquifer test results, regulatory requirements, cost analysis.

e) Laboratory analysis results for samples of IDW water and soil.

3) *Identify the information that is needed to establish the action level* – Action levels will be generated in the risk assessment using EPA guidance.

a) The regulatory action levels include California and federal drinking water standards, ALs in California, and California Public Health Goals (PHGs) (Table A-1 in the main text of this QAPP). Method detection limits and historical concentrations, as appropriate, will be used for unregulated drinking water compounds.

b) A risk assessor will evaluate human health and ecological risk; specific action levels will not be recommended.

c) California ALs will be applied.

d) If groundwater treatment is required, discharge options will be guided by MCLs, California ALs, California PHGs, Los Angeles Basin Plan Water Quality Objectives, National Pollutant Discharge Elimination System (NPDES) Permits, California Toxic Rules, and South Coast Air Quality Monitoring District Permits.

e) For IDW soil: 40 Code of Federal Regulations (CFR) Section 261.24, 22 California Code of Regulations (CCR) Section 66261.24, and waste acceptance criteria for offsite nonhazardous waste TSDF. For IDW water: California Toxic Rules (40 CFR Section 131.38), 22 CCR Section 64431 (Drinking Water Standards); Department of Health Services (DHS); Office of Environmental Health Hazard Assessment (OEHHA); and best professional judgment.

4) *Confirm that appropriate measurement methods exist to provide the necessary data* – The appropriate methods have been identified to meet project needs and are shown in the QAPP.

Step 4. Define the Boundaries for the Study

1) Specify the characteristics that define the population of interest –

a) Concentrations of chlorinated solvents and their degradation products, and other parameters, including VOCs, SVOCs, pesticides/PCBs, cyanide, perchlorate, and metals in groundwater within shallow unconsolidated sediments.

b) Same as (a). The groundwater samples will be collected following a systematic rather than statistical sampling design.

c) Concentrations of emerging contaminants in groundwater within shallow unconsolidated sediments.

d) Impacted groundwater within shallow unconsolidated sediments.

e) DW soil and water containerized in roll-off bins, tanks, 55-gallon drums, and other storage containers.

2) *Define the spatial boundary of the decision statement* –

a) Define the geographical area to which the decision statement applies – The boundary of OU-2 is the extent of the contamination in groundwater. One objective of the RI/FS (principal study question a) is to determine the extent of the spatial boundary. This geographical area applies to all principal study questions.

b) Divide the population into strata that have relatively homogeneous characteristics –For all the principal study questions, the contaminated aquifer may be considered one stratum.

3) *Define the temporal boundary of the decision statement* –

a) Determine the timeframe to which the decision statement applies – For principal study questions (a), (b), and (c), the timeframe is 2 years, the duration of the project. For principal study questions (d) and (e), the duration if indefinite because the liability associated with the remedy and IDW disposal extends into the future.

b) Determine when to collect data - The anticipated duration of the RI/FS is 2 years (all principal study questions).

4) *Define the scale of decision-making* – The scale of decision-making will be limited to the OU-2 area (the same geographic boundary).

5) *Identify practical constraints on data collection* – The sampling locations and schedule may depend on site access, permitting, and right-of-way constraints. For all principal study questions, there are practical funding limitations imposed by Congressional appropriations. The decisions and professional practices will be based on the current scientific understanding of contaminant fate and transport, adverse effects of contaminants on human health and environment, and treatment of contaminated media.

Step 5. Develop a Decision Rule

1) *Specify the statistical parameter that characterizes the population of interest*

   a) Sample analysis reports will be compared to action levels. Each value, not a statistical parameter such as mean concentration, will be evaluated against the action levels.

   b) Sample analysis reports will be compared to action levels on a point-by-point basis.

   c) Sample analysis reports will be compared to action levels. Each value, not a statistical parameter such as mean concentration, will be evaluated against the action levels.

   d) The full range of concentrations will be used semi-quantitatively in the evaluation of remedial alternatives.

   e) Sample analysis reports will be compared to applicable criteria on a point-by-point basis to characterize IDW soil for disposal and IDW water for treatment and discharge.

2) *Specify the action level for the study –See Step 3, Item (3).*

3) *Develop a decision rule (an "if...then..." statement) –*

   a) If an analytical result is greater than an action limit, then the sampling location can be included in OU-2 and may warrant further investigation.

   b) If the assessment of risk concludes the contamination at OU-2 poses an unacceptable risk to human health and/or the environment, a remedial action will be recommended.

   c) If emerging contaminants are detected, remedial alternative selection will include appropriate treatment technologies.

   d) If the collected data allow for clear identification of remedial alternatives, the alternative selection will be developed; otherwise, additional data or information will be collected.

   e) If waste soil profiling indicates the results meet nonhazardous waste criteria, the IDW soil will be shipped to a Class II landfill; otherwise, it will be transported to a Class I landfill. If waste profiling for IDW water indicates it meets regulatory requirements, it will be treated and discharged onsite; otherwise, it will be send to a TSDF.

Step 6. Specify Tolerable Limits on Decision Errors

Tolerable limits on decision errors, which are used to establish performance goals for the data collection design, are specified in this step.

1) *Determine the range of the parameters of interest* – The available historical range of the parameters of interest (for principal study questions a, b, c, and d) is known for a portion of OU-2 only. Concentrations of chlorinated hydrocarbons in groundwater ranged from nondetect to tens of thousands of micrograms per liter (μg/L). Concentrations of perchlorate were less than 7 μg/L. Part of principal study question (a) is to determine the range of contaminant concentrations. The historical range of contaminant concentrations in IDW (principal study question e) was not known at the time of preparation of this document.

2) *Identify the decision errors and choose a null hypothesis* – For principal study questions a through d: The DQO guidance prescribes the identification of the null hypothesis and associated decision errors for determining the number of random samples and the locations to attain a given level of confidence with the spatial distribution. Because samples will be collected at systematically selected locations, statistical decision errors cannot be defined. However, project error tolerances are defined in terms of precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters in Section A.4 of this QAPP. Analyte-specific accuracy and precision ranges are shown in Table A-2 of this QAPP. The project completeness goal is set at 90 percent. The laboratory data will be evaluated against PARCC requirements as outlined in the QAPP. Possible decision errors will be considered tolerable when data meet stated PARCC goals. For principal study question e, for IDW soil, guidance published in EPA Publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, will be followed (see Step 7, Item 3). For IDW water, mixing is expected to occur while each Baker tank is being filled, thus providing a well-mixed, homogeneous condition for sample collection.

3) *Specify a range of possible values of the parameter of interest where the consequences of decision error are relatively minor* – Not applicable.

4) *Assign probability values to points above and below the action level that reflect the tolerable probability for the occurrence of decision errors* – Applies to all principal study questions: Because sample locations are predetermined, probability values cannot be assigned. Instead, error tolerances are defined in terms of the PARCC parameters and are explained in Section A.4 of the QAPP. Needed project accuracy and precision ranges are shown in Table A-2 of the QAPP for the individual analytes. The completeness goal for the project is set at 90 percent.

Step 7. Optimize the Design

1) *Review the data quality objective (DQO) outputs and existing data*

a) The results will also be compared to historical data and to regulatory action levels (e.g., state and federal MCLs, California ALs, PHGs) as per the objectives described above. Discrete groundwater sampling and screening-level laboratory analysis of the discrete samples will be used to select the screen depth intervals of the new monitoring wells.

b) Existing (i.e., historical) data will also be included in the risk assessment. The analytical results for the discrete-depth groundwater samples and IDW samples will not be used in the risk assessment.

c) The results will also be compared to historical data and to regulatory action levels (e.g., California ALs) as per the objectives described above.

d) Areally averaged concentrations in groundwater will be used to estimate the average influent concentrations, which then can be used for the feasibility evaluation and treatment unit process design.

e) The waste profiling results will not be compared to past IDW results. For proper disposal, the waste profiling results will be compared to applicable screening criteria, federal and California hazardous waste action levels, and facility-specific waste acceptance criteria.

2) *Develop general data collection design alternatives –*

a) None anticipated. Sampling will be done from fixed well locations which are based on professional judgment, so there are no alternatives.

b) None anticipated. Samples will be collected at locations selected as part of principal study questions a and c.

c) None anticipated. Sampling will be done from fixed well locations which are based on professional judgment, so there are no alternatives.

d) None anticipated. The feasibility study will use areally averaged results from samples collected at fixed well locations which are based on professional judgment, so there are no alternatives.

e) Representative sampling of IDW soil can be achieved either by averaging the results of separate samples collected, or by collecting the samples, compositing first, and then analyzing the composited sample. The IDW water is expected to be relatively well-mixed as holding containers are filled. Given that the constituents are expected to be in the dissolved phase (not in nonaqueous phase), a single sample per container should be representative of the wastewater.

3) *For each data collection design alternative, select the optimal sample size that satisfies the objectives* - None anticipated for principal study questions a through d; the sample size is based on professional judgment.

For DQO e, for IDW soil, the optimal sample size (see table below) is based on the requirements listed in EPA Publication SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.*

Volume (CY)	**Minimum No. of Subsamples/Aliquots**	**Comments**
<10	2	1 sample from each half
10 to 20	3	1 sample from each third
20 to 100	4	1 sample from each quarter
>100	1 per 25 CY	1 sample from each 25-CY portion

Note that roll-off bins are each 10-cubic yard (CY) bins and more than one roll-off bin may be grouped together for composite sampling.

For IDW water, one sample per 20,000-gallon tank is expected to be adequate.

4) *Select the most resource-effective data collection design that satisfies the DQOs* –

The proposed groundwater monitoring well locations were selected to fill data gaps in areas where the extent of the groundwater contamination is not known. Discrete groundwater sampling will be used to select a representative well screen depth and minimize the number of wells necessary.

a) All historical and new data will be used.

b) Same as (a).

c) Same as (b).

d) Attempts will be made to separate relatively clean IDW from contaminated IDW. Compositing of samples from segregated IDW will minimize the number of laboratory analyses.

5) *Document the operational details and theoretical assumptions of the selected design in sampling and analysis plan* – The data collection program, including sampling rationale, is presented in the FSP (EPA, 2004).

ARCADIS

Appendix B

Laboratory QAPP

ADVANCED TECHNOLOGY LABORATORIES
QUALITY ASSURANCE PROGRAM PLAN

Revision 3

Effective Date: March 20, 2004

3283 Walnut Avenue
Signal Hill, CA 90755
PHONE: (562) 989-4045
FAX: (562) 989-4040
FAX: (562) 989-6348

General Manager: ______________________ Date: 3/10/04
Edgar P. Caballero

Laboratory Director: ______________________ Date: 3/11/04
Eduardo Rodriguez

QA Officer: ______________________ Date: 3/11/04
Glen Gesmundo

ADVANCED TECHNOLOGY LABORATORIES
QUALITY ASSURANCE PROGRAM PLAN

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ADVANCED TECHNOLOGY LABORATORIES
QUALITY ASSURANCE PROGRAM PLAN

1 QUALITY ASSURANCE ORGANIZATION

1.1 OVERVIEW

ADVANCED TECHNOLOGY LABORATORIES (ATL), a division of Environmental Treatment and Technology, Inc., (ETT), is a full service analytical laboratory, which provides technical and laboratory support for commercial and regulatory agencies. Clientele include consulting, engineering firms, city/local, various state agencies, and others clients requiring analytical services.

It is the purpose of this document to describe ATL's program to assure that analytical data generated by ATL are of a known quality and a known level of confidence. The policies and procedures in this document have been developed to meet NELAC and/or ELAP requirements as well as project specific requirements.

1.2 QUALITY ASSURANCE POLICY AND OBJECTIVES

ATL is committed to provide the client with analytical data of a known and documented quality sufficient to meet its data quality objectives in a reasonable time frame and at a fair cost. The reliability of the data generated by ATL is measured by the close adherence to quality control, qualifications and experience of personnel, and the organization's commitment in maintaining data integrity, validity, and usability.

The following statements describe the quality of the data required to be usable for the client.

1.2.1 Data Quality Objectives (DQOs)

Data quality objectives are used to assess the minimum data quality to ensure that the amount, type, and quality of data obtained during analytical processes are adequate to support and draw valid conclusions with a known level of confidence. DQOs also support specific decisions, and planning relative to remedial and regulatory actions.

The data quality objectives process facilitates the determination of the following:

1.2.1.1 Information and data requirements for the specified project.

1.2.1.2 Where, when, and how to collect samples to allow the most precise measurements as possible.

1.2.1.3 Laboratory Quality Assurance/Quality Control required to defend the data quality.

1.2.1.4 Required number of observations.

1.2.2 DQOs are usually expressed in terms of:

1.2.2.1 Precision

It is defined as the degree to which a set of observations or measurements of the same property obtained under similar conditions conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms.

1.2.2.2 Accuracy

It is defined as the degree of agreement between an observed value and an accepted reference or true value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. Accuracy may be assessed through the use of blanks, known quality control (QC) samples, and matrix spikes.

1.2.2.3 Representativeness

It is the degree to which data accurately represent a particular characteristic of a population or environmental parameter. It is a qualitative parameter that is most concerned with the proper design of the sampling program.

1.2.2.4 Completeness

It measures the amount of valid data obtained from a measurement system compared to the expected amount. Usually reported as a percentage.

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1.3.2 QA/QC Roles and Responsibilities

Specific QA/QC responsibilities are summarized as follow:

1.3.2.1 General Manager

The General Manager has the overall responsibility for the general operations of ATL, including but not limited to Administration, Business Office, Regulatory Affairs, and Technical Operations.

1.3.2.2 Technical Support Manager

The Technical Support Manager has an overall responsibility for the management of support departments including QA/QC, IT/LIMS, Health and Safety, Document Control and Regulatory Affairs. The Manager is responsible for:

- Supervising and administering the quality assurance program and providing an environment, in which quality work is produced.
- Ensuring that all general and client-specific quality assurance requirements are strictly followed.
- Resolving the approval/rejection of deliverable client sample data package and/or reports.

1.3.2.3 Laboratory Director

The Laboratory Director is directly involved in the day-to-day operation such as scheduling, staff training, QAPP implementation, technical peer reviews, etc. of their respective group. The Laboratory Director is responsible for:

- Enforcing the QA/QC procedures and requirements within the laboratory.
- Ensuring that sufficient numbers of qualified personnel are employed to supervise and perform the work of the laboratory.
- Recommending process improvements and corrective actions.
- Maintaining an environment that emphasizes an intelligent and responsible approach to producing high data quality and accuracy based on the SOPs carried out.

1.2.2.5 Comparability

It measures the confidence in comparing results in one experiment with the results of the same experiment on different samples. It is also demonstrated through the participation in round-robin performance evaluation studies and the use of standard reference materials that are traceable to the National Institutes of Science and Technology (NIST) and EPA.

1.2.3 Quality Assurance/Quality Control (QA/QC) Program

ATL's QA/QC program ensures that analytical measurement systems are maintained within acceptable limits and reproducibility. Specific sections of this QA/QC plan address various QA/QC procedures that are used to generate valid and defensible data. Some elements of the QA/QC program include:

1.2.3.1 Preventive Maintenance

All analytical instruments and equipment are checked and calibrated by the analyst each time the instrument or equipment is used. In addition, the instrument or equipment is rechecked and recalibrated depending on the usage either on a time basis or sample basis according to the Standard Operating Procedures (SOPs). Besides daily checks, a schedule of preventive maintenance is kept to reduce the likelihood of total failures. Instrument calibration and precision statistical records are kept to insure stability and reproducibility.

1.2.3.2 Quality Assessment Procedures

ATL employs quality assessment procedures to detect problems through data assessment and establish corrective action procedures that keep the analytical process reliable. Data validation is accomplished at all levels. Data reporting procedures start at the laboratory bench level. Supervisors, QA Officer, and Laboratory Director and/or his designated signatory personnel do the review of the final data package report.

1.3 ORGANIZATION AND PERSONNEL

1.3.1 Organization

Appendix A shows the organizational structure of the analytical services within Advanced Technology Laboratories. Appendix B shows a table of Key Personnel along with their assignments, responsibilities, education, and years of applicable experience.

1.3.2.4 Quality Assurance Officer (QA Officer)

The QA Officer reports to and is responsible directly to the Technical Support Manager for all matters on laboratory quality assurance. Specific roles include:

- Responsible for implementation and monitoring of the laboratory quality assurance program.
- Ensuring that all data generated is scientifically sound, legally defensible, and of known precision and accuracy.
- Monitoring the QA plan on a periodic basis to ensure compliance with the QA objectives of the laboratory.
- Developing and implementing new QA procedures within ATL to improve data quality.
- Conducting audits and inspections of all departments on a periodic basis; reporting the results of the audits to the General Manager, Laboratory Director, and Supervisors; and implementation of corrective actions to ensure compliance with the QA plan.
- Coordinating the analysis of performance evaluation (PE) samples for all analytical departments on a periodic basis.
- Evaluating the results; reporting the results to the General Manager, Laboratory Director, and appropriate Supervisors; and applying corrective actions as needed.
- Establishing and maintaining statistical and data records that accurately reflect the quality assurance performance of all analytical departments.
- Maintaining and overseeing the master sources of all SOPs, training logs, and completed/full laboratory notebooks.
- Serving as the in-house client representative on all projects inquiries involving data quality issues.
- Maintain and update the QA Program Plan on an annual basis (minimum).

1.3.2.5 Laboratory Supervisor(s)

The Laboratory Supervisors are directly involved in the day-to-day such as scheduling, supervision of laboratory procedures and reporting of results, staff training, etc. of their respective departments. The Laboratory Supervisors are responsible for:

- Enforcing the QA/QC procedures and requirements within their respective activities and areas of specialization.
- Monitoring validity of the analyses performed and data generated in the laboratory to assure reliable data.
- Supervising the staff training in the procedures described in the standard operating procedures (SOPs) as they apply to the assigned responsibilities of the staff.
- Recommending process improvements and corrective actions.

1.3.2.6 Project Coordinators (PC)

The Project Coordinator has the overall responsibility for the technical completeness, cost control, and adherence to schedules. Specific responsibilities include:

- Implementing the appropriate quality procedures for project activities in support of the QAPP.
- Communicating with the Laboratory Director and/or QAO relating to QA/QC activities.

1.3.2.7 Sample Control Officer

The primary responsibility is to manage the sample control section. The Sample Control Officer is responsible for overseeing sample log-in, proper documentation, sample tracking, sample storage, sample disposal/return, and coordination and scheduling of sampling programs. Other responsibilities include client contact, and assists with contract administration.

1.3.2.8 Document Control Officer

The Document Control Officer is responsible for the filing, retrieval and storage of the reports.

1.3.2.9 Staff (Chemists, Technicians and Support Personnel)

Every ATL laboratory personnel are responsible for the quality of work that is consistent with the requirements established by the ATL management. The laboratory personnel plays an active role in the ATL Laboratory quality program and whenever possible, make recommendations regarding the process improvements and corrective actions. Specific job descriptions are available in the Human Resource File.

The ATL personnel responsibilities include but not limited to:

- Providing the management and the QAO with the immediate notifications of the quality problems by submitting Non-Conformance forms.
- Identifying and carrying out the approved corrective actions within their respective activities and specialization.
- Participating in the training program (including reading SOPs and QA Manual, MDL determinations and Accuracy and Precision data).
- Following QA/QC criteria for all program requirements.
- Correct reporting of sample results and QC samples.

1.3.2.10 Work Cell

ATL defines a work cell as a group of analysts and sample prep technicians within the inorganic and organic section (see organizational chart). These work cells work together to perform the method analysis. Analysts perform the instrumentation analysis while sample prep technician do the sample preparation. The members of this group and their specific function within the work cell are documented in each method demonstration of capability (DOC) for applicable methods.

1.4 PERSONNEL TRAINING

The ATL training program is designed to ensure that all personnel are qualified and properly trained to perform all required tasks. The training program also provides that all pertinent health and safety issues are covered on a quarterly basis. It also provides for periodic evaluation of each staff member's skills by performance evaluation samples.

Initial training includes reading and understanding the method, Standard Operating Procedure (SOP) comprehension, standards preparation, method set-up, accurate reporting, correct and accurate QA/QC and routine instrument maintenance. Trainees are given supervised training by the department supervisor or by designated chemist(s) who already completed the initial proficiency. Once the initial training is complete, the chemist's initial proficiency demonstration can be determined from accuracy and precision data, testing of the SOPs, and demonstration through performance evaluation (PE) samples. All results are documented into the personnel training log by the QA Officer.

The QA Officer conducts internal "blind" performance evaluation samples as part of the training program. These "blind" performance evaluation samples are submitted to the analyst after the initial training has been completed and on an annual basis (more frequent if necessary). All results from the internal performance evaluation samples are evaluated for accuracy. The results are graded on a "PASS/FAIL" system. All analytes that "fail" must have a corrective action and a subsequent sample will be re-submitted.

The chemist must also submit "Accuracy and Precision" data by preparing and analyzing 4 replicate reference samples containing target analytes in a clean matrix. The accuracy and precision data is calculated from 4 Laboratory Control Samples (LCS) that are spiked with a secondary source standard. The results are evaluated for accuracy (average recovery) and precision (standard deviation of the recovery). The results are evaluated against method or in-house limits. If the data does not meet the criteria, then a corrective action is initiated. Once the problem is corrected, a new precision and accuracy data set is collected and evaluated. All forms and raw data is filed in the training log.

As part of the chemist's training, each chemist and technician must read the QA Manual whenever there is a revision to the manual. Each chemist must answer some questions and sign the questionnaire as documentation to reading the QA Manual. The questionnaire also allows the chemist to ask questions and give updates for the next revision.

Continuing (supplemental) training includes development of SOPs, learning the importance of documentation, the understanding of meeting QA/QC criteria and quality. Supplemental training can be obtained from reading different procedures, instrument manuals and related literature. Knowledge regarding methods and instrumentation can also be obtained from external training by agencies and manufacturers. Copies of completion certifications are kept in the chemist's training file.

The QA Officer maintains the training records. All employees' training records are updated on a monthly basis to reflect current training qualifications. The oversight of the training program is performed by the QA Officer, the department supervisors, and the Laboratory Director.

According to ATL's Employee Handbook, under section "Personal Conduct", disciplinary action, which may include discharge, will be taken for offenses such as: falsifying data and/or company records, violation of safety rules, breach of security and/or confidentiality, commitment of financial or legal resources without authorization of company officer." When a new employee begins work at ATL, they are required to read the Employee Handbook and an "Ethics and Data Integrity Agreement". Each document requires the employee to sign an acknowledgement memo stating that they have read and understood each item that was submitted to them.

2 FACILITIES AND EQUIPMENT

2.1 LABORATORY LAY-OUT

The facilities have two buildings each having one main entrance that is controlled by card access. ATL personnel monitor the entrance at Suite 3283 during business hours. All visitors, guests, and other non-laboratory personnel are required to sign the guest registry. All visitors are escorted within the facility.

ATL occupies several suites in a commercial business park. Suite 3283 includes the administrative offices, storage facility, Classical Chemistry department and Organic Prep. Suite 3275 includes the Volatile department, Semivolatile department, ICP group, AA group, Sample Control, Project Coordinator(s) and some offices. Appendix C shows ATL laboratory layout.

2.2 MATERIAL PROCUREMENT AND CONTROL

2.2.1 Supplies Management

To assure the quality of supplies used for various laboratory analyses, the following items are taken into account (Refer to SOP for Material Procurement for more details):

2.2.1.1 Materials, reagents, standards, solvent, and gases are carefully selected to meet specifications defined in the method analyses. Each new supply of these items are verified for their performance capabilities, freedom from impurities that interfere with the analysis, and background levels measured to check the degree of contamination.

2.2.1.2 Materials are dated upon receipt to establish their order of use, "as first in, first out basis," and to minimize the possibility of exceeding their shelf-life. Pertinent information such as name of supplier, lot number, expiration date, concentration, date opened, date received, and date expired into the chemical inventory logbook. Chemicals are then labeled with a chemical inventory code, date received, date opened, and date expired sticker.

2.2.1.3 Stock and working standards solutions are prepared fresh as often as required by their stability. These are checked for signs of deterioration (e.g., formation of precipitates, discoloration, and changes of concentration through calibration results). Standard solutions are properly labeled as to name of solution, concentration, solvent, date of preparation, and initial of who prepared. Standard preparation is documented in the standard preparation logbook. The standards are stored in places where these are protected from degradation and contamination.

2.2.1.4 Acids and bases are segregated in terms of storage. Various types of solvents are stored in flammable storage cabinets. Dry chemicals used for inorganic and organic analyses are stored in the chemical storage cabinet. Incompatible chemicals should not be stored together for safety reasons. Primary standards and working standards prepared for organic analysis are stored in the standard refrigerator/freezer.

2.2.1.5 Services such as electricity, air, gas, and vacuum are checked for proper specifications for efficient and reliable performance of the instruments.

2.2.1.6 Distilled water for volatile and semi-volatile organics is purchased from a commercial water distributor. Distilled water for wet chemistry analyses are obtained from water filter through resins (Type II water). The resistivity of the distilled water must be greater than 1 megohm-cm. The laboratory conducts daily checks of the reagent water by monitoring the conductivity and the pH. The conductivity must be equal to or less than 1 µhmo/cm and the pH does not have a specified range. Analyses such as metals, mercury, Ion chromatography, TOX/TOC utilizes Type I water. The resisitivity of the Type I water must be greater than 10 megohm-cm. The conductivity must be less than 0.1 µmho/cm and the pH does not have a specified range.

2.2.2 Subcontractors

Samples can be subcontracted to another laboratory, if ATL is not approved to perform a particular test or if the lab is not able to complete analysis of required tests. These samples must be subcontracted to an approved outside laboratory. A client may request that the subcontract laboratory have a certain approval or certification.

All data from subcontract laboratories must meet all project requirements. Samples must be re-analyzed if specified project requirements are not met. The final report is reviewed for typographical and technical errors.

2.2.3 Equipment Management

Information on the actual performance of the equipment is obtained before purchase request for a piece of equipment is made. The availability of the supplier's service to install and test it against specifications as part of purchase price is also considered. When first installed, an internal calibration of the instrument is performed using the manufacturer's manual. Analytical reference standards are analyzed for qualitative and quantitative checks on the instrument performance during the sample run. Routine preventive maintenance of the instruments/or equipment is done on a regular scheduled basis.

2.2.4 List of Instrumentation - Appendix D lists the various instrumentation and equipment.

2.2.5 Preventive Maintenance Activities and Schedules

Instruments are maintained according to the Standard Operating Procedures using the manufacturer documentation. Repairs are conducted as needed, either by manufacturer representatives or by in-house personnel. Routine maintenance (lamp replacement, etc.) is conducted as needed to maintain instrument integrity.

Critical equipment and instrumentation are maintained on a scheduled basis to minimize the downtime of measurement systems. Maintenance logbooks (hard bound) are kept for each equipment. All maintenance (routine and unscheduled) is recorded by the analyst. Each entry must contain at the minimum: date, event/problem, corrective action, proof of conformance, and initials.

2.2.6 Waste Disposal

Laboratory generated wastes are classified into various waste streams and are disposed according to the local, state, and federal regulations.

2.3 LABORATORY RESOURCES

When large or new projects are scheduled to arrive at the laboratory, the project coordinator or client service person should request all pertinent sample information from the client. This includes number of sample(s), matrix types, QC requirements, turn-around-time, data package requirements and expected sample delivery schedule.

A meeting of all key personnel is called to distribute the sample information for the project. Allocation of personnel, laboratory resources and materials are distributed for the type of work and the expected turn-around-time. Questions are given to the project coordinator or client service person. They in turn contact the client to clarify any laboratory questions.

3 SAMPLING HANDLING AND CHAIN-OF-CUSTODY (COC)

3.1 SAMPLE COLLECTION

Sampling is done by outside contractors mostly by clients, i.e., environmental engineering consultants, and government contractors.

3.2 SAMPLE PREPARATION

ATL prepares all sample containers, including trip or transport blanks, and used according to the requirements stated in 40CFR, Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants. Sample holding time, preparation, and analyses follow the specified method requested for analysis.

3.2.1 For volatile sample analysis, an aliquot of the solid sample is taken first for analysis. The remaining samples are then prepared for the rest of the required parameters. A separate vial or container with zero headspace is used for liquid samples

3.2.2 The frequency of QC samples within a given batch of a similar matrix is defined in the project QA/QC requirement. Specific QA/QC criteria for the QC samples such method blanks, matrix spike/matrix spike duplicate, laboratory control sample, field blank, etc. are defined in the method used for analysis and/or the project QA/QC requirement.

3.3 SAMPLE TRACKING

Samples received at ATL are considered as physical evidence and are handled according to the procedural safeguards established by EPA.

3.3.1 Standard Operation Procedure (SOP)

The Sample Control Login SOP describes in detail how samples are received, the step-by-step sample log-in process, how samples are tracked from receipt to completion, and the overall responsibilities of the Sample Control Officer.

3.3.2 Sample Verification

A sample custodian receives a sample shipment or delivery. An alternate person is designated to receive samples if the Sample Control Officer is not available. The following procedures are taken during the process.

3.3.2.1 Coolers should be opened under a fume hood, wearing the appropriate personal protection equipment.

3.3.2.2 The cooler temperature is taken and recorded on the project folder. The acceptance criteria for the cooler temperature are 2 - 6 degrees Celsius.

3.3.2.3 Presence or absence of custody seals or tape on the shipping containers and the condition of the seals (i.e. intact, broken, etc.) are noted on the chain of custody.

3.3.2.4 If the COC is not available with the samples, a Sample Control Personnel or Client Service person must call the client to request the COC.

3.3.2.5 The COC accompanying the samples is signed and dated. A copy of the COC is kept in the project folder.

3.3.2.6 The Sample Control Personnel must check agreement between client's sample labels, ATL's labels and COC. If there are any discrepancies, then client must be notified immediately of any problems.

3.3.3 Sample Login

3.3.3.1 Login begins with assigning an ATL Laboratory workorder number from ELIMS (Environmental Laboratory Information Management System). This is a six digit sequential number that identifies the samples by batches.

- Within each workorder, the samples are given an individual number starting at 001A. A sample is defined as a unique client ID and unique bottle/preservation. A workorder with 10 samples will be labeled as 047100-001A / 010A.

- For those samples that have the same client ID and a unique bottle/preservation must have a individual fraction assigned to each bottle. A sample with 3 fractions will be labeled as 047101-001A / 001C.

- For VOA vials, the ELIMS will assign multiple containers with 1 of 2, 2 of 2, etc.

3.3.3.2 A Master Sample Log is generated from the ELIMS. This contains the following information for every set of samples received: client name, project name, date of collection and receipt, matrix of the samples, the analyses requested, client sample ID, preservation, container type, due date, selected analyte list, initials of Sample Control personnel and Status (Turn-Around-Time). The log is printed out every day and is placed into a 3-ring binder. The log is then permanently bound with 5 days after the quarter ends. All old logbooks will be stored in the QA Office.

3.3.3.3 Other login information includes: information for specific sample handling, QA/QC, detection limits are documented in the "Comments" section of the sample login of ELIMS.

3.3.3.4 A sample-receiving checklist is filled out on the ELIMS. The checklist documents the carrier name, cooler temperature, shipment/sample condition questions and Sample Control personnel initials. A printout of the checklist is placed into the project folder.

3.3.3.5 A project folder is created for each WorkOrder. A WorkOrder COC generated by ELIMS is printed and placed into the plastic sleeve at the front of the project folder. Also , a printout of the WorkOrder Summary is placed inside the project folder for the Project Coordinator review.

3.3.4 Sample Labeling

After the samples have been logged into the ELIMS, a sample label is printed with the client ID, ATL laboratory number, date received and the barcode. The label is then affixed to the appropriate container.

3.3.5 Chain of Custody (COC)

Chain-of-custody procedures are used for a variety of samples in the laboratory. The purpose is to establish a detailed documentation of all transactions in which the samples are transferred from the custody of one individual to another. These procedures are used from the point at which the samples are collected to the opening of the samples in the laboratory, and the subsequent disposition of unused samples. A COC form documents sampling efforts and sample transfer from the field to a testing facility or between testing facilities. An example of an ATL chain-of-custody form is shown in Appendix E.

3.3.6 An ATL COC form is used for a set of samples received without a client's COC or equivalent form. It is used to document any sampling and analysis information contained on the sample label or as provided via FAX or mail by the client.

3.3.7 If samples need to be sent out to a subcontractor, a new ATL COC form, cross-referencing the original COC, is generated to accompany samples delivered outside the laboratory.

3.3.8 The traceability of the samples that are transferred to or from the laboratory is tracked by the use of the ATL laboratory number (batch) and client sample identification. These are monitored from the point of acquisition by the laboratory through the sample preparation, analysis, data reduction, data validation, final report generation, and sample disposal.

3.3.8.1 Sample traceability throughout the laboratory is achieved by using the ELIMS Sample Tracker.

- When the samples are given to the chemist, ELIMS records the date, time, samples, the name of the chemist the samples were transferred to and the Sample Control personnel initials.
- When the samples are returned to Sample Control, the date, time, samples and the location of the walk-in refrigerator are recorded.
- When samples are transferred to Sample Disposal, ELIMS records the date, time, samples, transfer location and the Sample Control personnel initials.
- Samples that are consumed, broken, disposed or returned to the client are recorded by ELIMS with the date and time of the transaction.

3.3.8.2 In the Sample Preparation Areas, sample traceability is documented on the organic extraction and metal digestion logbooks. After the samples have been prepared, the extractor or digestor gives the extracts and an extraction printout from ELIMS to the analyst.

3.3.8.3 Sample traceability continues through the analysis, data reduction, data validation, final report generation, and sample disposal by the use of the ATL laboratory number. All result templates, folders, invoices, and final reports document the ATL laboratory number for all samples.

3.4 SAMPLE STORAGE

3.4.1 For Samples

Samples received by the laboratory are placed into 3 walk-in refrigeration units, which are restricted to authorized laboratory personnel. Samples for volatile analysis are kept in a separate refrigerator. The temperature of the refrigerators is monitored for the acceptable temperature range.

3.4.1.1 Acceptable refrigerator temperature range is 4 °C ± 2 °C.

3.4.1.2 Temperature of the sample storage refrigerators is monitored daily for acceptable working temperature range using an NIST traceable thermometer. The thermometer is calibrated against an NIST reference thermometer every twelve months. (See Section 6.1.2 for more details.)

3.4.1.3 The SOP for Thermometer Calibration describes the calibration of thermometers. Electronic thermometers are rechecked daily to confirm the stability of the calibration.

3.4.1.4 Corrective actions are taken if the refrigerators malfunction or the temperature is out of acceptable range. A Non-Conformance Form is submitted to the QA Officer following the corrective action.

3.4.1.5 If a client submits samples to the laboratory, which could or/will, go to litigation, the laboratory can make provisions to store the samples into a separate walk-in refrigerator. The refrigerator can be locked and secured until a written notice is received from the client. The client must approve transferring or disposal of samples. A written authorization must be faxed to the laboratory confirming status of samples. All documentation must be placed into the project folder.

3.4.2 For Extracts, Digestates and Leachates

Once the sample has been processed, the extract, digestate or leachate must be stored according to method specified conditions. The digestates for metals are stored at room temperature until sample analysis. The digestates for mercury are analyzed on the same day as the digestion. Organic extracts can be stored up to 40 days at 4 ° C(± 2 °C). The extracts must be stored in a separate refrigerator from that housing the analytical standards. The leachates (from tests such as TCLP) can be stored prior to the preparation stage or the analytical stage. Each has a holding time and/or preservation requirements. See method for details.

3.5 SAMPLE DISPOSAL

Unused and remaining portions of the samples received in the laboratory are kept for at least 45 days upon receipt (or as stated by the project requirements). A sample disposal fee is charged if client prefers the laboratory to dispose them. Laboratory sample disposal is in accordance with the local, state, and federal regulations.

Laboratory waste is segregated according to hazard class. Non-hazardous waste is disposed of in one of two ways: non-hazardous aqueous waste is neutralized and disposed with excess water. Non-hazardous soil samples are disposed of in the regular trash.

Hazardous wastes are segregated by organic and inorganic type material. This material is packaged in steel drums. Oil samples are also segregated into steel drums for recycling. Waste solvents and solvent-based extracts are stored in steel drums for recycling. A licensed disposal company performs all handling of hazardous waste.

3.6 SAMPLE CONTAINERS PREPARATION

To ensure sample integrity, steps are taken to minimize contamination from the containers by lot analyses verification of cleanliness. If the analyte(s) to be determined is organic in nature, the preferred container is made of glass. If the analyte(s) is inorganic, then the container is plastic. Sample containers supplied to the clients are either commercially obtained as pre-cleaned containers or verified clean by ATL lab analyses. Certificate of analysis is accompanied with the various types of sample containers purchased commercially.

The laboratory provides chemical preservation in sample containers for clients requesting containers ahead of time before collection.

4 DOCUMENT CONTROL

A document control program is established to ensure that all documents issued or generated at ATL are accountable and traceable. Listed below are the general guidelines of the document control program.

4.1 LOGBOOKS/NOTEBOOKS

4.1.1 Documentation Policy

The general guidelines for documentation of any records or entries are:

4.1.1.1 Legibility: All entries must be legible. Printing is preferable, but writing is acceptable for all characters, including notes.

4.1.1.2 Recording Entries: All entries are made using indelible ink pens, preferably blue or black.

4.1.1.3 Review all forms before entering information.

4.1.1.4 The originator(s) of all entries must be identified by initial(s) or signature(s). In most cases, there are specific places on the data sheet for initials to identify the originator of entries or groups of entries.

4.1.1.5 All blanks with no data must contain a diagonal line or "Z" out and initialed and dated.

4.1.1.6 The use of abbreviations is kept to a minimum. Only nationally accepted abbreviations (e.g., mg/Kg, mL, µg/Kg) and chemical formula abbreviations (e.g., NaOH, HCl) may be used without further clarification. Other abbreviations can be used providing the abbreviation can be traced to the corresponding abbreviation explanation.

4.1.1.7 All mistakes are corrected at the time the error is discovered. Cross out with a single line so as to remain legible. **Do not** erase, write over, or use correction material. Each cross out is initialed and dated. If the reason for the change is not obvious, then the reason must be stated.

Note: If there is insufficient space for all or part of the correction information, enter a footnote call out near the incorrect data and enter the required information as a comment elsewhere on the data sheet, notebook page, etc.

4.1.1.8 The cover of each notebook is identified with subject identification (instrument, method, procedure, etc). All analysts making entries in the book are required to print their names with corresponding initials and signatures in the second page of each logbook. All documentation entered must be clear, legible and detailed. Each entry must be dated by month, day and year in which the data were recorded and signed by the person performing the work or entering the data.

4.1.2 Logbook Maintenance and Archiving Procedures

4.1.2.1 Analyst Notebooks: Each analyst maintains a personal bound notebook. The analyst is able to keep notes during training sessions. Whenever the analyst's logbook becomes full, it is the analyst's responsibility to get a new replacement logbook from the QA Officer. These logbooks are subject to audits.

4.1.2.2 Instrument Maintenance Logbooks: Each instrument must have an associated logbook to record maintenance (routine and unscheduled) and repairs. These logbooks are audited for complete entries during inspections. The logbook is replaced and archived by the QA Officer. The maintenance logbooks are archived for 5 years.

4.1.2.3 Standard and Extraction Logbooks are required to keep records of standard traceability and sample preparation. These logbooks are audited for completeness, standard traceability, standard preparation, correct QC sample batching, etc. The logbooks are replaced and archived by the QA Officer. The Standard and Extraction Logbooks are archived for 5 years.

4.1.2.4 Injection run logbooks are used to record the sequence of the sample run, corresponding standards with standard codes and corresponding QC samples. The runlogs are replaced and archived by the QA Officer. The runlogs are archived for 5 years.

4.1.2.5 ATL Sample Login Logbook: The logbook is used to record the unique ATL sample identification, date sampled, turn-around-time, project, matrix type, client, client's sample identification, test, preservation, bottle type, and initials of login personnel. The logbook is audited for completeness during inspections. The logbook is archived by the QA Officer. The Sample Login logbooks are archived for 5 years.

4.1.2.6 Miscellaneous Logbooks: Refrigerator temperature log, balance check log, distilled water check, etc. are used to record various laboratory equipment. The logbooks are audited for daily monitoring and completeness. The logbooks are replaced and archived by QA Officer. The logbooks are archived for 5 years.

4.1.2.7 An Access database has been developed to record the name of the logbook, notebook code identification, department, and type of logbook, log number, date of issue and archival date.

4.2 STANDARD OPERATING PROCEDURES (SOP)

4.2.1 Development

As defined by the EPA, an SOP is a written document, which provides directions for the step-by-step execution of an operation, analysis, or action, which is commonly accepted as the method for performing certain routine or repetitive tasks.

The SOP format for analytical methods consists of Scope and Application; Summary; Interferences (for Method SOPs only); Equipment and Reagents; Sample Preparation; Procedures; Quality Control; Data Reduction and Calculations; Method Performance; Sample Preservation and Holding Times, Safety, Hazards and Waste Disposal; Pollution Prevention; Waste Management; Attachments and References.

4.2.2 Distribution

4.2.2.1 All SOPs for internal laboratory use are controlled and numbered documents. A red "controlled" stamp is placed onto each page of the document. Document name, SOP code, date issued and initials are recorded into a "Control SOP" logbook.

4.2.2.2 When revised SOPs are released into the laboratory, the "old" version is replaced with the "new" version. The "old" version is logged back into the "Controlled SOP" logbook. The document collected from the laboratory is then destroyed.

4.2.3 Archiving and Storage

4.2.3.1 All original, signed SOPs are stored in 3-ring binders according to categories: General Laboratory Practices, Volatile Organics, Semi-volatile Organics, Metals and General Chemistry.

4.2.3.2 Within the 3-ring binder, page dividers partition each SOP. Within each partitioned section, the current SOP version is in the front while the "older" versions are located in the back.

4.2.3.3 All hardcopies of the SOPs are stored in the QA Office indefinitely.

4.2.3.4 Electronic copies of the SOPs are located on the QA computer and on the server. The computer is virus checked at all times to deter virus data corruption. A second electronic copy is stored on a specified directory on the network. Only the QA Officer has access to this directory. The network is backed-up on a weekly basis followed by an incremental, daily back up.

4.3 PROJECT FOLDER

4.3.1 Organization

A project folder is generated for each batch of samples received at ATL. Sample Control initiates the collection or preparation of the documents for the project folder. The sample control documentation includes:

4.3.1.1 Chain of Custody

4.3.1.2 Project specific information regarding:

- Detection Limits
- QA/QC analyses
- Reporting requirements
- Invoicing information
- Extended storage
- Air bill
- Faxes

4.3.1.3 The SOP for Sample Login describes the process of logging samples and developing the project folder.

4.3.2 Project File Archival

Once the final report has been mailed to the client, the project folder (which contains information such as the chain-of-custody, correspondences, raw data, reports, etc.) is archived to a file room, which has limited access. The Document Control Officer is responsible for the archiving/retrieval of the project folders. The Document Control SOP describes how documents are archived and retrieved by the Document Control Officer.

All records shall be retained for 5 years from the generation of the last entry in records. For clients that require archival of records longer than 5 years, a formal request letter must be submitted prior to the start of project.

If the company closes or changes ownership, all records will be stored and /or be transferred to the new business owner(s). Also, all clients will be notified. All project folders will be available if requested. If the client does not respond, all data associated to that ATL number would be discarded after a year from the date of notification.

4.4 CONFIDENTIALITY

Original, signed reports are printed on ATL's letterhead. The original report is released to the client as specified on the Chain-of-Custody. ATL's client confidentiality policy assures that reports and associated documentation will only be released to the original client. ATL will only release data with a written authorization from the client. For requests from a regulatory agency or from a court-of-law, the laboratory is obligated to submit all information.

4.5 COMPUTER DATA SECURITY

4.5.1 All personnel are issued a unique network user name by IT upon approval from the Technical Support Manager. Each person is required to create a unique password. The passwords should be changed at least once a year.

4.5.2 All raw data is transferred to "archive" folders located in the network server. Only the primary user and the department supervisor have access to these directories.

4.5.3 All client reports are generated from ELIMS. Client Service personnel prints the final report for faxing. The department supervisors, QA officer and upper management have access to change reviewed data. All changes are accepted by password. Amended reports are re-printed and faxed to the client.

5 ANALYTICAL METHODOLOGY

5.1 ANALYTICAL PROCEDURES

Analytical procedures used for various laboratory analyses are in accordance with the EPA approved methods. Any variances in the methods have been documented for equivalency based on accuracy and precision data. All variances in the analytical methods are noted in all corresponding SOPs. These SOPs are available to the analyst under controlled copies. New methods and/or SOPs are distributed throughout the laboratory by issuing control copies. Old methods/SOPs are collected before the new documents are given to the analysts. ATL employs analytical procedures that have been certified by the State of California Environmental Laboratory Accreditation Program (ELAP). A list of methods certified by ELAP is shown in Appendix H (List of Approved Methods and Certification).

5.2 CALCULATION OF DATA QUALITY INDICATORS

All data generated at ATL are assessed for data quality in terms of accuracy, precision, completeness, representativeness, and comparability. All of these DQO are dependent on the scope of work and the level of quality control required.

Precision, accuracy, and completeness are calculated following the equations presented below. The results are reported in QC tables with the final reported results. When the project or client requests QC data, a blank, duplicate, spike, and a standard reference material are analyzed for each set of samples for precision and accuracy data. The exact quality and quantity of the QC samples are determined by the project or client.

5.2.1 Precision

A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision can be expressed in terms of the relative percent difference (RPD), relative standard deviation (RSD) and/or standard deviation. Analytical precision is measured by

$$RPD = \frac{(C_1 - C_2)}{[(C_1+C_2)/2]} \times 100$$

Replicate analyses of individual samples. If calculated from two replicates, use RPD.

Where:

RPD = the relative percent difference
C_1 = the larger of the two observed values
C_2 = the smaller of the two observed values

If calculated from three or more replicates, use RSD or coefficient of variation.

$$RSD = \frac{S}{Y} \times 100\%$$

Where:
RSD = the relative standard deviation
s = the standard deviation
$\bar{Y}$ = mean of replicate measurements

Standard deviation, s, is defined as follows:

$$S = SQRT(\Sigma \frac{(Y_i - \bar{Y})^2}{n-1})$$

Where:
s = standard deviation
SQRT = square root
Y_1 = measured value of replicate
$\bar{Y}$ = mean of replicate measurements
n = number of replicates

5.2.2 Accuracy:

Accuracy is measurement of the bias of a system. For measurements where matrix spikes, matrix spike duplicates and laboratory control samples are used, use percent recovery.

$$\%R = 100 \times \frac{S - U}{C_{sa}}$$

Where:
%R = percent recovery
S = measured concentration in spiked aliquot
U = measured concentration not spiked aliquot
C_{sa}= actual concentration of spike added

5.2.3 Completeness:

A measure of the amount of valid data obtained from a measurement system compared to the amount that expected to be obtained under normal conditions. Defined as follows for all measurements:

$$\%C = 100 \times \frac{V}{n}$$

Where:

%C = the percent completeness
V = the number of measurements judged valid
n = the total number of measurements necessary to achieve a specified statistical level of confidence in decision making.

5.2.4 Method Detection Limit (MDL)

ATL's methods for which the MDL are developed have been based on the EPA methods for 40 CFR 136 - Definition and Procedure for the Determination of the *Method Detection Limit.* ATL redefines the limit of detection for each parameter annually. The calculation for MDL is defined as follows for all measurements:

$$MDL = t_{(n-1,\, 1-\alpha=0.99)} \times S$$

Where:

MDL = the method detection limit
S = the standard deviation of the replicate analyses
$t_{(n-1,\, 1-\alpha = 0.99)}$ = the Students' t-value appropriate to a 99% confidence level and a standard deviation estimate with n-1 degrees of freedom.

6 INSTRUMENT CALIBRATION AND INTERNAL QA/QC PROCEDURES

6.1 CALIBRATION

Calibration is the process for determining the correctness of the assigned values of the physical standards used or the scales of measuring the instruments.

ATL has established procedures for the calibration of each laboratory instrument and equipment. These are calibrated following the requirements of the specific methods of analysis. All calibrations and acceptance criteria are checked for conformance to these method requirements. The data resulting from the instrument calibration and the associated QC procedures used determine the frequency of the calibration process.

6.1.1 Miscellaneous equipment

6.1.1.1 Analytical and top-loading balances are calibrated using weights which are calibrated against Class "1" weights. The calibration weights bracket the weight to be measured. This calibration is recorded in the calibration notebook. The reading must be within the specified acceptance limits (See Balance SOP for details of acceptance limits). If the reading falls outside the acceptance limit, a non-conformance form must be submitted and the problem addressed. The balances are calibrated and serviced annually by an outside service technician.

6.1.1.2 Thermometers throughout the laboratory are calibrated annually against a NIST traceable thermometer. Each thermometer is labeled with an identifier code and the positive or negative correction factor. The positive or negative correction factor must be applied to all temperature readings from that particular thermometer. The reading must be within the specified limits for the type of thermometer. If the temperature reading falls outside the acceptance limit, a non-conformance form must be submitted and the problem addressed.

6.1.1.3 Pipettes are calibrated by measuring the weight of a volume of water. The calibrations of the pipettes are performed annually. The reading must be within the specified acceptance limits (See Pipette SOP for details of acceptance limits). If the reading falls outside the acceptance limit, a non-conformance form must be submitted and the problem addressed.

6.1.2. Classical Chemistry

6.1.1.1 UV/VIS Spectroscopy/Colorimetric

The Helios Gamma Spectrophotometer is initially calibrated by the manufacture. The spectrophotometer is then set to the method specified wavelength. The instrument is calibrated using a 3 to 5 point calibration utilizing standards from particular test methods. The coefficient of determination (r^2) of a linear regression calibration curve must be 0.995 or greater. A single mid-point standard is used for the continuing calibration verification (CCV). The CCV standard must correspond to ± 10% of the true value.

6.1.2.2 Titration

Calibrations for titration are based on the standardization against a primary standard. The concentration of an unknown solution can be determined by reacting a measured quantity of the unknown solution with a measured volume of an appropriate solution of known concentration.

6.1.2.3 Gravimetric

Gravimetric methods require that the sample be dried until the difference in consecutive weighings is less than 0.0005 grams. All weighings are based upon using a calibrated balance.

6.2 GENERAL QC INFORMATION

Method QA/QC is those measures taken to evaluate the method protocols and provide assurance that the values being obtained are correct. These are run at a frequency of one (1) per batch (batch QC sample frequencies and batch size are defined by the method series requirement and/or project requirements). A batch is defined as a group of samples, which are analyzed together with the same method sequence and with the manipulations common to each sample within the same time period or in continuous sequential time periods. Samples in each batch must be of similar composition.

The analysis of QC samples for organics, metals, and general chemistry demonstrate that adequate recoveries have been obtained in spiked (fortified) samples, check for matrix interference in samples, confirm that reagents used for analyses have no impurities that interfere with the analysis of the analyte, identify if cross-contamination between samples has occurred during workup, check laboratory performance against reference materials, and verify the precision and accuracy of methods. The results from the QC samples such as matrix spike (MS), matrix spike duplicate (MSD), laboratory control sample (LCS), and surrogates (if applicable) are compiled and graphed on control charts. The primary functions of the control charts are to define control limits for the individual methods and as a performance monitoring tool.

The laboratory follows the minim um quality control requirements specified by each method (if and only if all parameters are the same). In general, these method specific quality control requirements will be used as a guideline to determine approximate limits until in-house limits can be generated. The laboratory will follow whichever limits are the most stringent.

If the method does not specify limits or guidelines for quality control requirements, the laboratory will default to recovery limits such as 80 – 120% and RPD of 20% (for methods such as wet chemistry) or recovery limits of 50 – 150% and RPD of 50% (for methods such as extractable organics, metals) until in-house limits can be generated.

If the method only has guidelines for the quality control requirement, then the laboratory will use them strictly as guidelines and set default limits as stated above until in-house limits can be generated.

For Field Trip and Equipment Blanks, if contaminant analyte is at or above the reporting limit and is greater than 1/10 of the amount measured in any sample, the results are considered suspect and are reported as estimated.

6.3 Instrument Calibration, Laboratory QC Procedures and Corrective Actions

Instrument calibration, QC procedures, acceptance criteria and corrective actions are described on Appendix F for organic and inorganic instrumentation analyses. In general, the following QC procedures apply:

6.3.1 Method blanks are prepared for analyses and should contain analytes less than the reporting detection limit. If the concentration of the associated blank is above the detection limit, re-analysis of the sample(s) must occur.

6.3.2 Matrix Spike (MS) / Matrix Spike Duplicate (MSD) determines accuracy and precision by calculating the amount recovered and the relative percent difference.

6.3.2.1 Acceptance criteria for recoveries of spikes used are established in-house limits.

6.3.2.2 In general, the spike concentration is spiked at or near the midpoint calibration concentration.

6.3.2.3 Spikes and duplicates results are compared with the laboratory generated control limits for acceptance criteria.

6.3.3 A Laboratory Control Sample (LCS) is prepared and analyzed for each matrix. If the LCS fails out of limits, evaluate the system and re-analyze LCS to confirm the result. If the reanalysis passes, the sample results can be reported. If the re-analysis fails, the entire batch must be re-processed (if sample amount permits). A non-conformance form must be filled out and submitted with the sample data.

7 LIMITS OF DETECTION

The Method Detection Limits (MDL) are conducted by the laboratory on an annual basis. MDLs are performed on a more frequent basis if conditions are changed from the previous MDL study. Examples of such conditions are a new instrument, new or refurbished detector or detector components, or different purge and trap device. The MDL is defined as the minimum concentration of a substance that can be measured and reported with a 99% confidence level that the analyte concentration is greater than zero. This procedure consists of analyzing seven (7) aliquots of a standard at 3 to 5 times the estimated MDL, which is taken through all the sample processing steps of the analytical method. MDLs are matrix dependent. The MDL is defined as the student T-factor times the standard deviation from the seven replicates. See Section 5.2.4 for the equation to calculate the MDL.

Once the MDL is generated, the department supervisor, the Laboratory Director, and the QA Officer reviews and approves the MDL study as being valid. The QA Officer then collects and maintains all MDL studies.

Instrument Detection Limits (IDL), for ICP metals analysis only, is determined in the same manner as the MDL with the exception that the standards are not processed through the digestion step process.

Each MDL is compared to the current reporting limits. The analyte reporting limit must be greater than or equal to the established MDL value. The spiking concentration must not exceed 10 times the MDL value. If the MDL fails to meet these criteria, the MDL needs to be re-extracted and re-analyzed.

8 DATA COLLECTION, VALIDATION, REPORTING, AND ARCHIVING

Upon completion of all required analyses, the results are submitted for final report generation. At all stages of Data Handling (Data Collection, Validation, and Reporting), the laboratory staff and management check all data before the final deliverable package is released. The following steps detail the internal laboratory procedure that ensures the final report in a complete and concise format. The General Manager or a designated signatory person can only release the final report to the client (with their signature).

8.1 DATA COLLECTION

Computers are used to collect and quantify data from the GCMS, GC, AA, ICP and ICP-MS. For data from instruments, the data can be imported into the ELIMS for calculations and reporting. General chemistry results are manually typed into the ELIMS for reporting.

All data are spot-checked for accuracy. Concentration of the analytes found in the analysis for organics, metals, and general chemistry will be expressed according to required units depending on the sample matrix, i.e., µg/L or µg/Kg.

Data collection and review include the following:

8.1.1 Review of sample documents for completeness by the analyst(s) at each step of the analysis scheme.

8.1.2 Daily review of quality control indicators such as blanks, surrogate recoveries, duplicate analyses, matrix spikes analyses, etc. The quality control indicators must be evaluated using specific criteria described in Section 8.0. If any indicator is outside the acceptance criteria, then the analyst must follow the SOP for Non-Conformance, Corrective Actions.

8.1.3 All analyses must have data qualifiers for such items as:

- All results for EPA 8015B (modified) for fuels must be flagged if the sample pattern does not match the reference pattern.
- All results must be flagged if the method blank contains hits above the reporting limit.
- All results must be flagged for samples analyzed past holding time.

8.1.4 All manual integrations must be dated and initialed by the analyst.

8.1.5 The analyst prints a "preliminary" report from the ELIMS program. The analyst reviews of all raw data and the "preliminary" report prior to submittal for:

- Correct sample identification on raw data
- Correct analytical method
- Correct analyte list to report
- Matrix type and Units
- Dilution Factors
- Calculations and Significant Figures
- MDL, PQL
- Correct and complete QA/QC
- Complete technical check

The analyst submits a "First Level Data Review" sheet for each ATL batch number.

8.1.6 All data must be reported in a consistent unit to allow comparability of data among organization. The standard units used to report data are listed below.

8.1.7 Units of mass/volume, volume/volume, mass/mass are reported as parts per unit. The common units are:

- Parts per Million or ppm: mg/L or uL/mL or mg/Kg
- Parts per Billion or ppb: ug/L or nL/mL or µg/Kg

8.1.8 Physical parameters are reported using common units as:

- pH (pH units)
- Hardness (mg $CaCO_3$/L)
- Alkalinity (mg $CaCO_3$/L)
- Temperature (°C or °F)
- Dissolved Oxygen (mg/L)
- Flow Rate (mL/min)

8.1.9 Data is usually reported on an "as received" basis. Solid samples results are reported in wet basis but if requested can be reported in dry basis. Other reporting units are allowed, based upon client request. Refer to appropriate project descriptions for special reporting of units.

8.2 DATA VALIDATION

Once the preliminary report has been generated, the department supervisors review the report for technical errors against the raw data submitted by the analyst(s).

Results must be checked for correlation between test results from different tests. Some tests are grouped together by type (i.e. demand, general minerals, etc.). The results from each grouping should correlate through ratios, percentages, etc. If the ratios do not meet the criteria, then check for reporting and calculation errors. If all reporting and calculations are correct, then re-analyze one or more of the tests (as necessary) and re-evaluate.

The following steps are taken during the data validation process:

- All final data are visually checked for consistency and reasonableness. Series of grossly high or grossly low results are also checked. Unusually high or unexpectedly low results are verified using a different method, where possible.
- All reported data must be within the working linear range of the instrument.
- LCS and spike recovery must be within the specified control limits, or within the laboratory generated limits, when applicable. Any out-of-control data are properly qualified with an appropriate explanation (e.g., matrix interference).
- All analytical problems encountered during sample analysis must be properly addressed to provide explanations for data reviewers.
- Checks on calculations are as follows
  - Calculations from new analyst(s) are reviewed at 100%
  - A calculation from a trained analyst(s) is subject to a minimum of a 50% review.
- Supervisors must review the raw data and report for:
  - All assigned samples are properly analyzed
  - Correct matrix and units
  - Correct and complete QA/QC
  - Correct calculations (including sample preparation factor and sample dilutions)
  - Special instruction met
- The supervisor approves the "Second Level Review Section" on the bottom of the "First Level Review" sheet. If there are any problems or questions, the supervisor sends the entire data package back to the analyst for review.

8.3 FINAL REPORT & REVIEWS

8.3.1 Final Reports

After the supervisor reviews the preliminary report, the data package is submitted to the Project Coordinator(s). The Project Coordinator(s) reviews the entire package and then fill-out a "Project Coordinator" checklist which documents typographical errors, holding time issues, project specific requirements, etc. The Project Coordinator prints the final report, which includes sample results and applicable QA/QC. The Project Coordinator approves each page of the report prior to faxing. Preliminary results can be faxed to the client with a disclaimer that the results are preliminary. In order to avoid miss-communication of results, no verbal results are given to the client.(see Appendix I)

Validated results can be e-mailed or transferred to diskette at the client's request. If there are amendments to the results, a new hardcopy report must be generated. A new electronic copy can be submitted to the client.

8.3.2 Final Review

All reports are then sent to the Laboratory Director or the designated signatory person for final review. Copies of the final report are kept in the project/batch folder, and are then archived.

If the final report is found to be incomplete or additional errors are found, it is then documented and returned to the department supervisors for correction.

QA Officer reviews at least 5% of the data generated. If the final report is found to be incomplete or errors found, it is then returned to the department supervisors for correction. An amended report is generated and sends to the Laboratory Director or the designated signatory person for final review.

8.4 AMENDMENTS

Procedures for amendments and/or additions to documentation are:

- Typographical errors (client initiated) are documented by fax from the client or by documenting the conversation on the telephone log.

- Re-analysis of a test parameter may be necessary if the data is questionable to the analyst/supervisor.

- When completed, the supervisor reviews and validates all data for precision, accuracy, completeness, and comparability.

- If any result is changed, the report is amended and is faxed and mailed to the client.

- All data is archived into the project folder.

8.5 CLIENT COMPLIANTS AND QUESTIONS

When a client has a question regarding analytical data, Project Coordinator will fill out a client complaint form and direct the questions to the department supervisors. The following steps should be followed to review data:

- Review report for typographical errors
- Review results for calculation errors
- Review raw data (calibrations, method blanks, QA/QC, dilution/concentration factors, tuning, etc.)
- Inspect original sample for visual indication of result validity.
- Inspect documentation such as the COC, verify correct sample was analyzed.
- Reanalyze sample in question by original method and by a different method to confirm results (if authorized by project coordinator)
- Inform client of findings.

All finding must be documented in the Client Complaint form.

8.6 DATA ARCHIVING

All electronic data generated by instruments are backed-up at a minimum of every 4 weeks. All data is copied from the instrument computers to specific directories on the network. Only the primary user and the department supervisor have access to these directories. The network is backed-up on a weekly basis followed by an incremental, daily tape back up. These files are then copied to a recordable CD for permanent storage.

Reports generated for the client are saved directly to a specified directory on the network. Amended reports are retrieved from and saved to the network directory. The network is backed-up on a weekly basis followed by an incremental, daily tape back up. These files are then copied to a recordable CD every 6 months.

9 CORRECTIVE ACTION

The need for corrective action comes from several sources: equipment malfunction; failure of internal QA/QC checks; failure of performance of system audits; and non-compliance with QA requirements. The Non-Conformance event is documented on a Non-Conformance/Corrective Action form. The details of how the Non-Conformance/Corrective Action form is completed and routed is in the Standard Operating Procedure (SOP).

9.1 IDENTIFYING THE PROBLEM

Listed below are the steps taken to assure corrective action is implemented

9.1.1 When measurement equipment or analytical methods fail QA/QC, the problem is immediately brought to the attention of the department supervisor, the Laboratory Director and/or QA Officer. These personnel must assess whether the problem or departure has any effect on QC policy. The analyst, supervisor, QA Officer, Sample Control personnel or Project Coordinator(s) personnel, can initiate the Non-Conformance form. The previously mentioned groups can also recommend possible corrective actions to problems.

9.1.2 If QC measurements are found to be unacceptable, the analyst must follow procedures found in Section 8. Some unacceptable results may require re-analysis or re-preparation. If the re-analysis is within acceptable criteria, then the analyst does not submit a Non-Conformance form. If the re-analysis is not within acceptance criteria, then a Non-Conformance form must be submitted to document the possible matrix effects.

9.1.3 When a result in a performance audit is unacceptable, the laboratory identifies the problems and implement corrective actions immediately. Also, the unit section leader suspends the analytical work until the problem has been resolved.

9.1.4 When a system audit reveals an unacceptable performance, work is suspended until corrective action has been implemented and performance has been proven to be acceptable.

9.1.5 If failure is due to equipment malfunction, the equipment is repaired, precision and accuracy are reassessed, and the analysis is re-run. All attempts are made to reanalyze all affected parts of the analysis so that in the end, the product is not affected by failure of QA requirements.

9.1.6 All incidents of QA failure and the corrective action tasks are documented and reports are placed in the appropriate project file.

9.2 DOCUMENTING THE NON-CONFORMANCE

Once the non-conformance has been identified, a non-conformance form must be filled out and submitted to the QA Officer. The non-conformance form is a 2 page carbon-less form in which the copy is placed into the project folder and the original is submitted to the QA Officer.

The non-conformance forms contain incident description, samples affected, possible cause, corrective action, and proof of conformance.

9.3 NON-CONFORMANCE TRACKING

Once the Non-Conformance is submitted to the QA Officer, it is recorded into an Access database. This database is able to track Non-Conformances by department, analyst, test methods, matrix type, etc.

9.4 REPORTS

Non-Conformance reports for all departments are given to the Laboratory Director. Each department supervisor is also given a Non-Conformance report for his or her respective departments. The report is generated by the type of non-conformance (internal standard failed, refrigerator temperature out of limits, etc.) and by those non-conformances that are still outstanding.

The general manager/ laboratory director will decide the release of the reports having non-conformances items. Decision making for releasing the report are based on the following: (1) Technical Level –bench level operation, (2) Legal level –QA/QC conformance and regulatory, (3) Business –based on client data usage.

9.5 CLOSURE

Those non-conformances that are outstanding must be closed by the time the next report is issued to management. If these non-conformances are not closed, the QA Officer must investigate the problem and close the non-conformance.

10 HOLDING TIMES AND PRESERVATION

The laboratory conforms to all regulations for holding times and preservations. See Appendix G for tables of holding times and preservations (Referenced from EPA SW-846).

11 VERIFICATION PRACTICES

11.1 INTERLABORATORY COMPARISONS

For interlaboratory performance evaluation samples, ATL utilizes the data to evaluate the analyst compared to other analysts in the area. The results of the interlaboratory comparison are recorded onto the analyst-training file. If there are "unacceptable" results, the analyst must submit a Non-Conformance Form.

11.2 PROFICIENCY TESTING PROGRAMS

ATL participates in performance evaluation sample analyses as a requirement of NELAC (National Level) and ELAP (State Level). The laboratory must perform proficiency samples for wastewater, drinking water and hazardous waste. If there is "unacceptable" result, the analyst must submit a Non-Conformance form. A corrective action letter is submitted to the State Agency for all analytes that did not pass acceptance criteria. Another proficiency sample must be submitted for evaluation.

11.3 REFERENCE MATERIALS

Reference materials can be used in the laboratory to verify results against a certified value. These reference materials are purchased from NIST certified vendors. ATL utilizes certified reference materials to validate methods, verify instrument performance, preparation procedures, standard preparation and calibrations.

11.4 INTERNAL QUALITY CONTROLS

The QA Officer conducts internal "blind" performance evaluation samples as part of the training program. These "blind" performance evaluation samples are submitted to the analyst after the initial training has been completed and every 12 months after proficiency has been established. All results from the internal performance evaluation samples are evaluated for accuracy. The results are graded on a "PASS/FAIL" system. All analytes that "fail" must have a corrective action and a subsequent sample will be re-submitted.

12 LABORATORY AUDITS AND APPROVALS FROM OTHER AGENCIES

12.1 AGENCY AUDITS

ATL retains the laboratory approval from National Environmental Laboratory Accreditation Program (NELAP) through the California Department of Health Services and the Environmental Laboratory Accreditation Program (ELAP). (See Appendix H for ATL's Certification). NELAP/ELAP perform inspections of the laboratory every 2 years. Any recorded deficiencies are corrected and a response letter is submitted to ELAP.

12.2 CLIENT AUDITS

Clients can audit or inspect the laboratory for conformance to EPA methods and/or specific project requirements. After the audit, a formal letter describing any findings is submitted to the laboratory. All findings will require corrective actions and evidence or proof of conformance for the response letter.

12.3 INTERNAL LABORATORY AUDITS

Internal audits are performed on a quarterly basis but may be performed more frequently if the QA Officer determines a need for more frequent audits. An internal audit encompasses Sample Control, Organics, and Inorganics. Items checked for include, but are not limited to the following:

- Runlog are checked for completeness, verification of calculations, and for standard traceability.
- Balances, oven temperatures, refrigerator temperatures are being recorded.
- Standard logbooks are checked for completeness and for traceability.

The internal audits are documented on checklists during the actual audit. A form report is generated based on the findings, and is then distributed to the General Manager, Laboratory Director, and the department supervisors.

All deficiencies found during an internal audit are written into a report. The report is then given to the General Manager, Laboratory Director, and the department supervisor. All corrections must be completed within 10 working days. A follow-up inspection is performed on the outstanding findings. Findings not completed are documented in the monthly report to the Laboratory Director and/or General Manager .

If deficiencies during the internal audit compromise the quality of data, an immediate corrective action is implemented by the QA Officer, department supervisor, Laboratory Director and/or the General Manager (if necessary).

13 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Data from formal performance audits of the laboratory's activities are reviewed directly by the QA Officer, General Manager, Laboratory Director, and the department supervisors.

All quality assurance or quality control issues are discussed among the QA Officer, General Manager, Laboratory Director, and the department supervisors. The report can be used as a focal point for discussion involving corrective action. Any corrective action taken is decided with the concurrence of the unit department supervisors, the QA Officer, and/or Project Coordinator, and the Laboratory Director.

The QA Officer provides a QA/QC management report on a monthly basis to the General Manager. The report describes any significant quality assurance problem and/or solution, results of performance and system audits, assessment of accuracy and precision data, and health and safety issues. At the end of the calendar year, an overall QA/QC report will be compiled that will outline problems (short-term and long-term), solutions, areas to improve, and long-term goals for the upcoming year. The supervisors, Laboratory Director, and General Manager can also make comments and/or suggestions to the report.

14 REFERENCES

14.1 Federal Register, 40CFR Part 136, October 26, 1984, "Guidelines Establishing Test Procedures for Analysis of Pollutants the Clean Water Act.

14.2 Taylor, John K., Quality Assurance of Chemical Measurements, Lewis Publishing, 1987.

14.3 USEPA, Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA-600/4-79-019, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1979.

14.4 USEPA, Methods for Chemical Analysis of Water and Wastes. EPA-600/4-79-020, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1979.

14.5 USEPA, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Office of Soil Waste and Emergency Response, Washington, D.C., 1987.

14.6 USEPA, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Office of Soil Waste and Emergency Response, Washington, D.C., 1992.

14.7 USEPA, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. SW-846, Office of Soil Waste and Emergency Response, Washington, D.C., 1996.

14.8 USEPA, Testing Methods: Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater. EPA-600/4-82-057, Environmental Monitoring and Support Laboratory, Cincinnati, OH, 1982.

Appendices

Advanced Technology Laboratories 3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562-989-4045 Fax: 562-989-4040

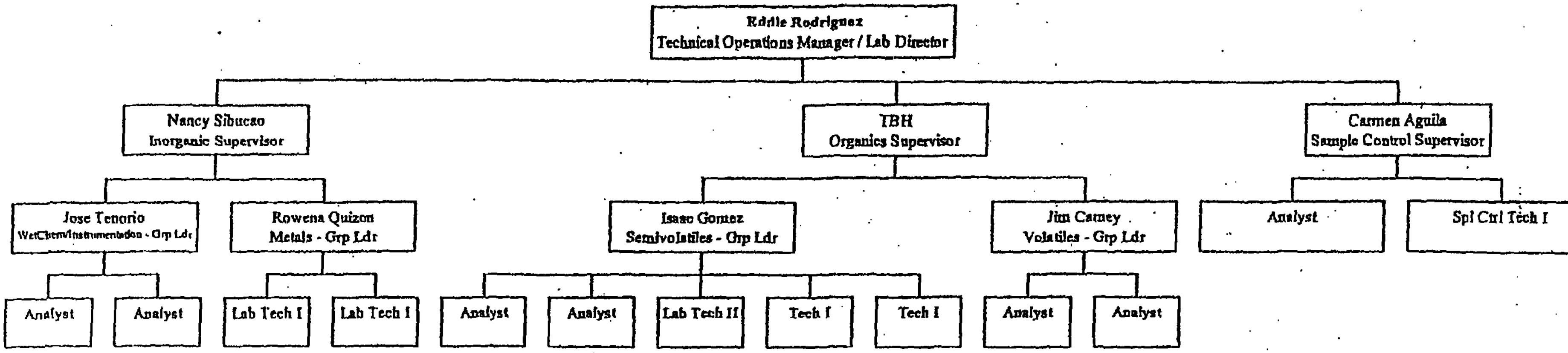
Appendix A
ATL Organizational Chart

Advanced Technology Laboratories, Inc.

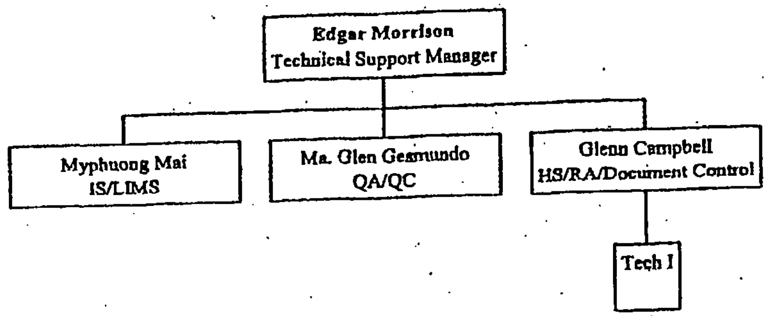
Ed Caballero
General Manager

- **Purl Romualdo**
  Sales/Marketing Manager
- **Eddie Rodriguez**
  Tech. Operations Mgr / Lab Director
- **Edgar Morrison**
  Tech. Support Manager
- **Ed Romualdo**
  Finance/Accounting Manager

Operations


Eddie Rodriguez
Technical Operations Manager / Lab Director
Nancy Sibucao
Inorganic Supervisor
TBH
Organics Supervisor
Carmen Aguila
Sample Control Supervisor
Jose Tenorio
WetChem/Instrumentation - Grp Ldr
Rowena Quizon
Metals - Grp Ldr
Isaac Gomez
Semivolatiles - Grp Ldr
Jim Carney
Volatiles - Grp Ldr
Analyst
Spl Ctrl Tech I
Analyst
Analyst
Lab Tech I
Lab Tech I
Analyst
Analyst
Lab Tech II
Tech I
Tech I
Analyst
Analyst

Support


Edgar Morrison
Technical Support Manager
Myphuong Mai
IS/LIMS
Ma. Glen Gesmundo
QA/QC
Glenn Campbell
HS/RA/Document Control
Tech I

Appendix B

List of Key Personnel and Responsibilities

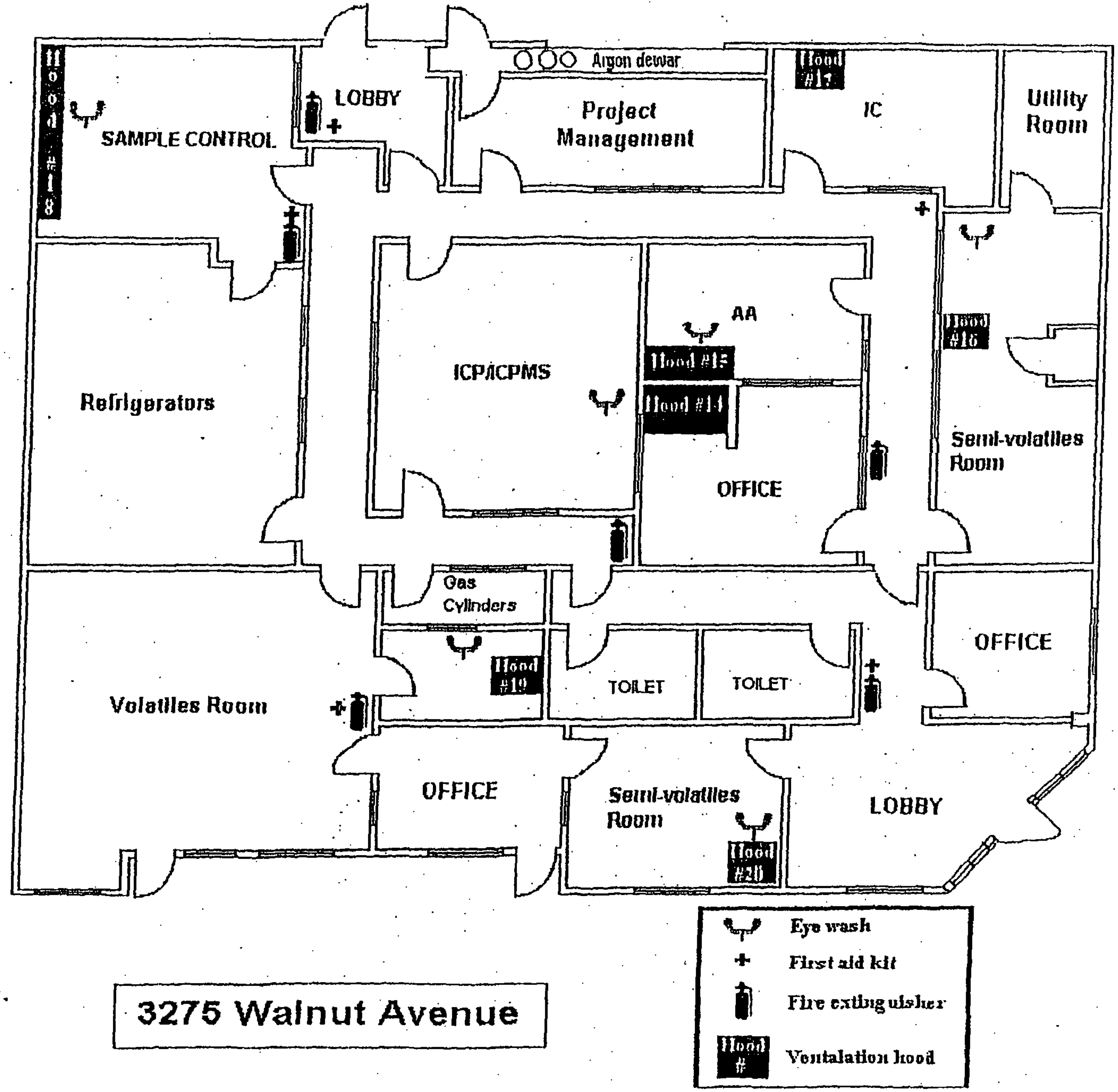
Advanced Technology Laboratories
Key Personnel

Name	Title	Responsibilities	Years of Experience	Education
Edgar Caballero	General Manager	· Supervising and administrating the quality assurance program. · Ensuring that all general and client-specific quality assurance requirements are strictly followed. · Resolving the approval/rejection of deliverable client sample data package and/or reports.	**32 Years**; 11 years as Chemist, 9 years as President of CRL, 4 years as President of ET&T, 8 years as General Manager of ATL	B.S., Chemistry
Puri Romualdo	Administration Director/ Project Manager	· Defining and meeting the project requirements including the contractual requirements of the NFESC program. · Implementing the appropriate quality procedures for project activities in support of the QAPP. · Communicating with the Technical Operation Manager and/or QAO relating to QA/QC activities.	**32 Years**; 11 years as Chemist, 10 years as Vice-President of CRL; 4 years of Vice-President of ET&T; 8 years as Vice-President of ATL	B.S., Chemical Engineering

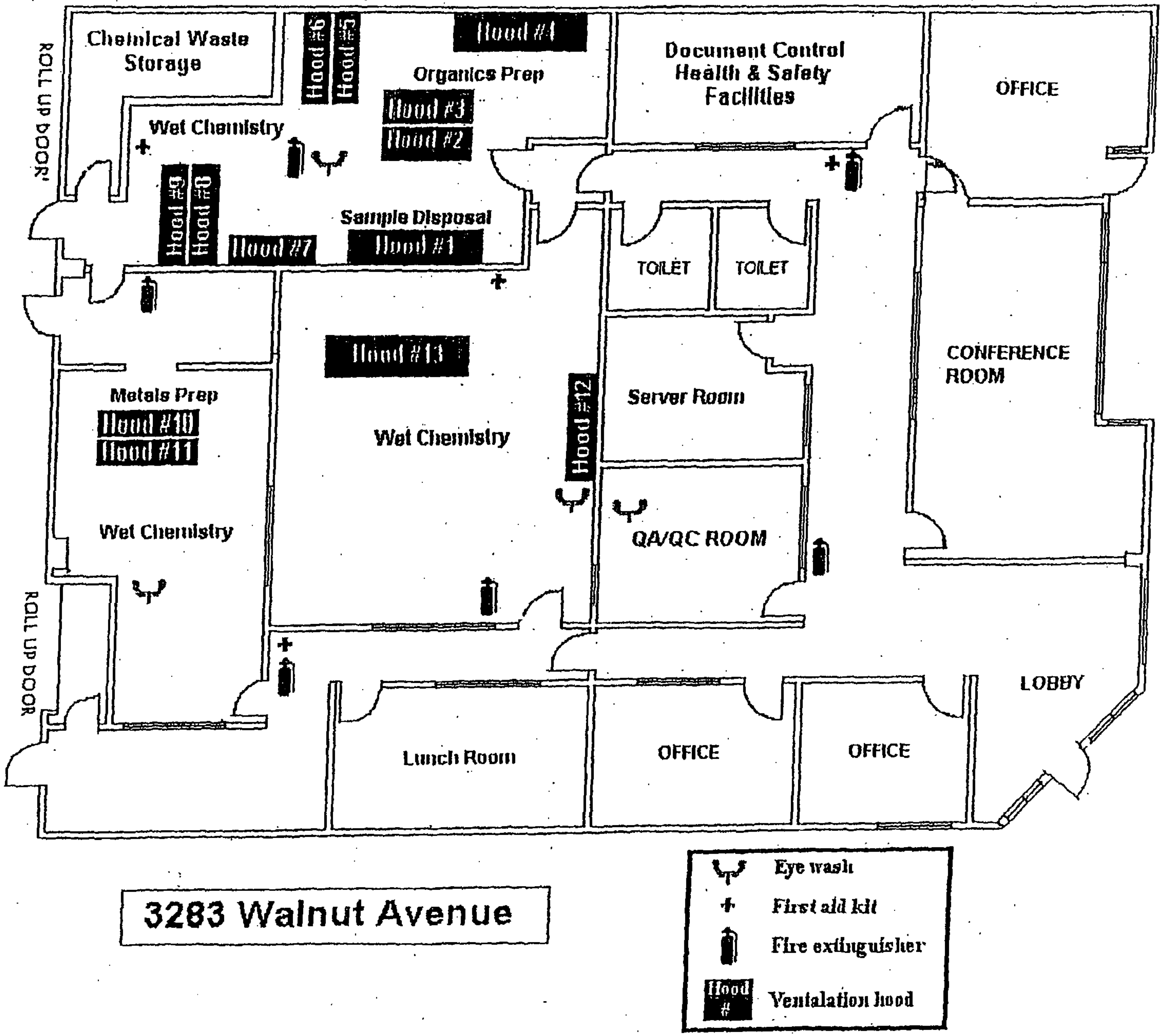
Name	Title	Responsibilities	Years of Experience	Education
Eddie Rodriguez	Laboratory Director/Technical Operations Manager	· Ensuring that sufficient numbers of qualified personnel are employed to supervise and perfom the work of the laboratory. · Enforcing the QA/QC procedures and requirements within their respective activities and areas of specialization. · Recommending process improvements and corrective actions · Maintaining an environment that emphasizes an intelligent and responsible approach to producing high data quality and accuracy based on the SOPs carried out.	**12 years;** 2 year as Laboratory Director.7.5 years as department supervisor, 3.5 years as staff chemist.	B.S., Chemical Engineering
TBH	Organic Supervisor	· Enforcing the QA/QC procedures and requirements within their respective activities and areas of specialization. · Recommending process improvements and corrective actions. · Supervising the staff training in the procedures described in the standard operating procedures (SOPs) as they apply to the assigned responsibilities of the staff. · Maintaining an environment that emphasizes an intelligent and responsible approach to producing high data quality and accuracy based on the SOPs carried out.		
Nancy Sibucao	Inorganic Supervisor	· Enforcing the QA/QC procedures and requirements within their respective activities and areas of specialization. · Recommending process improvements and corrective actions. · Supervising the staff training in the procedures described in the standard operating procedures (SOPs) as they apply to the assigned responsibilities of the staff. · Maintaining an environment that emphasizes an intelligent and responsible approach to producing high data quality and accuracy based on the SOPs carried out.	**6 Years;** 4 years as Chemist, 2 year supervisor	B.S Chemical Engineering

Name	Title	Responsibilities	Years of Experience	Education
Glen Gesmundo	QA/QC Officer	· Responsible for implementation and monitoring of the laboratory quality assurance program · Ensuring that all data generated is scientifically sound, legally defensible, and of known precision and accuracy. · Monitoring the QA plan on a periodic basis to ensure compliance with the QA objectives of the laboratory. · Developing and implementing new QA procedures within ATL to improve data quality. · Conducting audits and inspections of all division sections on a periodic basis. · Coordinating the analysis of performance evaluation (PE) samples for all analytical divisions on a periodic basis. · Evaluating the results; reporting the results to the General Manager and appropriate Group Leaders; and applying corrective action as needed. · Establishing and maintaining statistical and data records that accurately reflect the quality assurance performance of all analytical divisions. · Maintaining and overseeing the master sources of all SOPs, training logs and completed/full laboratory notebooks. · Serving as the in-house client representative on all projects inquires involving data quality issues.	**3 Years;** 3 years Organic Chemist; 3 months QA Officer	M.S., Agricultural Chemistry minor in Environmental Science BS Chemical Engineering

Appendix C
Laboratory Lay-Out



3275 Walnut Avenue



3283 Walnut Avenue

Appendix D
List of Instrumentation and Equipment

EQUIPMENT LIST

(updated 03/10/04)

Volatile Organics - EPA Method 8240/8260/624			
Qty	**Equipment**	**Make**	**Model**
2	Gas Chromatograph	Hewlett Packard	5890 Series II
2	Gas Chromatograph	Hewlett Packard	6890
1	GC Mass Spectrometer	Hewlett Packard	5971A MSD Quadrapole
1	GC Mass Spectrometer	Hewlett Packard	5972 MSD Quadrapole
2	GC Mass Spectrometer	Hewlett Packard	5973 MSD Quadrapole
2	Purge & Trap Concentrator	Tekmar	LSC 3100
2	Purge & Trap Concentrator	Tekmar	LSC 3000
1	Purge & Trap Concentrator	Tekmar	Velocity XPT
3	Auto Sampler	Tekmar	Precept II
1	Auto Sampler	Tekmar	Solatek 72
1	Auto Sampler	Archon	5100
4	Data System	Hewlett Packard	Enviroquant
1	Analytical Balance	Mettler	BD202
4	Computers	Dell	Optiplex GXI
2	Printers	Hewlett Packard	Laser Jet 4

[illegible]			
Qty	**Equipment**	**Make**	**Model**
2	Gas Chromatograph	Hewlett Packard	5890 Series II w/FID/PID
1	Gas Chromatograph	Hewlett Packard	5890 w/FID/PID
2	Purge & Trap Concentrator	Tekmar	LSC 3100
1	Purge & Trap Concentrator	Tekmar	LSC 3000
2	Auto Sampler	Tekmar	Precept II
1	Auto Sampler	Archon	5100
3	Data System	Hewlett Packard	Enviroquant
3	Computer	Dell	Optiplex GXI
2	Printer	Hewlett Packard	Laser Jet 4, 6P

Semi-volatile Organics - EPA Method 8270/625			
Qty	**Equipment**	**Make**	**Model**
2	Gas Chromatograph	Hewlett Packard	6890
2	GC Mass Spectrometer	Hewlett Packard	5973 MSD Quadropole
1	Liquid Auto Sampler	Hewlett Packard	7683
1	Liquid Auto Sampler	Hewlett Packard	6890 series
2	Data System	Hewlett Packard	Enviroquant
1	Hood	Presscott	Custom
1	Refrigerator	VWR	Explosion Proof for Standards
2	Computer	Dell	Opteplex GX1
1	Printer	Hewlett Packard	Laser Jet 5

Semi-volatile Organics - EPA Method [illegible]			
Qty	**Equipment**	**Make**	**Model**
2	Gas Chromatograph	Hewlett Packard	5890 Series II w/dual ECD
2	Gas Chromatograph	Hewlett Packard	6890 Series w/ dual ECD
2	Gas Chromatograph	Hewlett Packard	5890
1	Gas Chromatograph	Hewlett Packard	5890 Series II w/2 FID
4	Liquid Auto Sampler	Hewlett Packard	7673
2	Liquid Auto Sampler	Hewlett Packard	6890
2	Liquid Auto Sampler	Hewlett Packard	7683
6	Data System	Hewlett Packard	Enviroquant
5	Computer	Dell	Optiplex GXI
1	Computer	Dell	Optiplex GX100
1	Printer	Hewlett Packard	Laser Jet 4
1	Printer	Hewlett Packard	Laser Jet 4000
1	Printer	Hewlett Packard	Laser Jet 1100
1	Hood	Custom Made	
3	Refrigerators	Various	

Metals [illegible] Series			
Qty	**Equipment**	**Make**	**Model**
1	Inductively Coupled Plasma	Thermo Jarrell Ash	ICAP 61E Trace Simultaneous
1	Inductively Coupled Plasma	Perkin Elmer	Optima 4300DV
1	Inductively Coupled Plasma_Mass Spectrophotometer	Perkin Elmer	ELAN 6100
2	Auto Sampler	Perkin Elmer	AS 91, AS93 plus
1	TJA Auto Sampler	Thermo Jarrell Ash	TJA
1	Chiller	Polyscience	
1	Chiller	Neslab	
1	Analytical Balance	Sartorius	BA100S
3	Computer	Dell	Optiplex Gx1, GX150,Gn+
2	Printer	Hewlett Packard	Laser 4000/Laser 4100

Metals [illegible]			
Qty	**Equipment**	**Make**	**Model**
1	Atomic Absorption Spectrometer	Perkin Elmer	AAnalyst 300
2	Autosampler	Perkin Elmer	AS-90
1	Graphite Furnace	Perkin Elmer	AAnalyst 600
1	Mercury Cold Vapor Analyzer	Perkin Elmer	FIAS 400
22	AA Lamps	PE	Various Elements
1	Auto Diluter	Perkin Elmer	Autoprep-50
1	Centrifuge	Centrifuge International	Model HN
1	Hood	Prescott	Custom
3	Data System	Perkin Elmer	AAnalyst
3	Computer	Dell	Gxa,GX1,Gnt
1	Printer	Hewlett Packard	LaserJet 4 L

Inorganics - EPA Method 500 Series TOX/TOC			
Qty	**Equipment**	**Make**	**Model**
1	TOC Analyzer wit Boat Sampler	Dorhman	DC-190 for water & soil
1	TOX Analyzer	Dorhman	DX-2000 for water & soil
1	Ion Chromatograph	Dionex	ICS-2000
1	Ion Chromatograph	Dionex	DX-4500 series
1	Ion Chromatograph	Dionex	DX-100
2	Data System	Dorhman	Integrated w/instrument
2	Data System	Dionex	Integrated w/instrument
3	Auto Sampler	Dionex	AS40
1	Computer	NEC	Optiplex 433s/Mx/Infinia
1	Computer	Dell	Optiplec GXi
1	Computer	Toshiba	Pentium
1	Refrigerator		
2	Printer	Epson	LQ570
1	Printer	Hewlett Packard	Laser JetIIISi
1	Conductivity meter	Orion	115
Classical Wet Chemistry			
Qty	**Equipment**	**Make**	**Model**
1	Analytical Balance	Sartorius	SP 180
1	COD Block Heater	Hach	—
1	Convection Oven	Scientific Products	DK-3
1	Cyanide Distillation Set-up	Andrews	MIDI-Cyanide
1	Flash Point Apparatus	Precision Scientific	Pensky Marten Closed Cup
4	Hot Plate/Stirrer	Corning/Thermolyne	PC-101
1	Muffle Furnace	Thermolyne	Furnace 1400
1	Oil and Grease Extraction Set-up	Horizon/JT Baker	SPE-DEX 3000XL/Speed Disk
1	pH Meter	Orion	720A
1	DO Meter	Orion	720A
1	Phenol Distillation Set-up	Witeg	Custom
3	Specific Ion Electrodes	Orion	Miscellaneous
1	Turbidimeter	Le Motte	2008
1	UV/VIS Spectrophotometer	Thermo	Helios Gamma
1	Nano Pure System	Barnstead	
3	Computer	Dell	Optiplex GX1,GX110,GX100
1	Printer	Hewlett Packard	Laser 4050N
1	Incubator	Precision Scientific	Low Temp. Incubator 815
1	Hood	Prescott	Custom

Sample Preparation Chemistry			
Qty	Equipment	Make	Model
4	Hot Block Digester	AJ Scientific/Env.Express	——
2	Acid Proof Cabinets	——	——
2	Fire Proof Cabinets	——	——
8	Hot Plate	Corning/Linberg/Thermolyne	Various
1	Shaker	Labline	Orbit Shaker
1	Labeler	Zebra	Z4000
2	Computer	Dell	Optiplex GX100, GXi
3	Fume Hood	Labconco	
8	Fume Hood	Prescott	Custom
2	Sonicator	Tekmar	Various
1	STLC Extractor	Env. Express	——
6	TCLP ZHE Extractor	Millipore	——
2	TCLP Bottle Extractor	Millipore	——
1	TCLP Rotator	Environmental Express	——
3	Top Loading Balance	Mettler	DB202
5	TurboVap Concentrator	Zymark	TurboVap 500
1	Refrigerator		

Health and Safety			
Qty	**Equipment**	**Make**	**Model**
9	First Aid Kits	Lab Safety Products	Various
12	Fire Extinguishers	Underwriter Laboratories	First Alert
14.	Half Face Masks	3M	With Organic Vapor Cartridges
5	Portable Eye Wash/Plumbed	Fend-all Company	EyeSaline
1	Safety Shower	Lab Safety Supply	—
1	SCBA-5 minute	North	
2	SCBA-30 minute	North	800 Series
2	SCBA-15 minute	Scott	—
1	Spill Containment Set-up	Labconco	—
1	Spill Kit	Labconco	—
Sample Control			
Qty	**Equipment**	**Make**	**Model**
1	pH Meter	VWR Scientific	2000
1	Conductivity meter	Orion	115
1	Turbidimeter	Le Mott	208
1	Top Loading Balance	Sartorius	B3103
20	Sample Coolers	Miscellaneous	Various sizes
1	Walk-in Refrigerator	Norlake	4°C coolers for Volatile
2	Walk-in Refrigerator	Norlake	4°C coolers for Volatile/Soil
2	Computer	Dell	Optiplex GX1
1	Computer	Dell	Optiplex SX 270
1	Printer/Copier/Fax	Hewlett Packard	Laser Jet 3150
1	Printer	Hewlett Packard	Laser Jet 5P
1	Fume Hood	Presscott	Custom
Field Compliance Services			
2	Bailers/Sampling Thief		
1	Field Truck	Chevy	S-10
1	H_2S monitor		
1	pH meter	VWR	2000/3000 series
1	Steam Cleaning Equipment	Hotsy	
1	Utility Vehicle	GMC	Safari
1	Utility Vehicle	Chevrolet	Blazer
2	24-hr Composite Sampler	ISCO	2910

Document Control/Client Services			
Qty	**Equipment**	**Make**	**Model**
2	Computer	Dell	GX260,GX240
2	Computer	Dell	GX1, Precision 450
2	Printer	Hewlett Packard	Laser Jet 4000, Deskjet 820CSE
2	Copier	Hewlett Packard	990CX1
2	Printer/Fax Machine	Minolta	Di520/EP8600
1	Scanner	Ricoh	IS4500E
1	e-Cabinet	Ricoh	45332
Laboratory Management System (LIMS)			
1	Server 1	Dell	LIMS Server
1	Server 2	Dell	Data File
1	Server 3	Dell	LIMS backup server
1	Server 4	Dell	Email
2	Barcode Printer	Zebra	Z4000
2	Barcode Scanner	Metrologic	MS 6720

Appendix E
ATL Chain-of-Custody Form

CHAIN OF CUSTODY RECORD

Advanced Technology Laboratories
3275 Walnut Avenue
Signal Hill, CA 90807
(562) 989-4045 • Fax (562) 989-4040

FOR LABORATORY USE ONLY:

P.O.#: ____

Logged By: ____ Date: ____

Method of Transport
- Client ☐
- ATL ☐
- CA OverN ☐
- FEDEX ☐
- Other: ____

Sample Condition Upon Receipt

1. CHILLED	Y☐ N☐	4. SEALED	Y☐ N☐
2. HEADSPACE (VOA)	Y☐ N☐	5. # OF SPLS MATCH COC	Y☐ N☐
3. CONTAINER INTACT	Y☐ N☐	6. PRESERVED	Y☐ N☐

Client: | Address: | TEL: ( )

Attn: | City | State | Zip Code | FAX: ( )

Project Name: | Project #: | Sampler: (Printed Name) (Signature)

Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:
Relinquished by: (Signature and Printed Name)	Date:	Time:	Received by: (Signature and Printed Name)	Date:	Time:

I hereby authorize ATL to perform the work indicated below:
Project Mgr /Submitter:
Print Name ____ Date ____
Signature ____

Send Report To:
Attn: ____
Co: ____
Address ____
City ____ State ____ Zip ____

Bill To:
Attn: ____
Co: ____
Address ____
City ____ State ____ Zip ____

Special Instructions/Comments:

Sample Disposal
Unless otherwise requested, all samples will be disposed 45 days after receipt.

Records Archive / Disposal:
- ☐ Laboratory Standard (1 year)
- ☐ Other ____
- ☐ Return To: ____

Storage: • Sample : $2.00 / sample / month (after 45 days)
• Records: $1.00 / ATL workorder / month (after 1 year)

Circle or Add Analysis(es) Requested

SPECIFIED APPROPRIATE MATRIX

QA / QC
- RTNE ☐
- CT ☐
- SWRCB ☐
- Logcode ____
- OTHER ____

ITEM	LAB USE ONLY: Batch #: Lab No.	Sample Description: Sample I.D. / Location	Date	Time	8081A (Pesticides)	8082 (PCB)	8260B (Volatiles)	8270C (SNA)	6010B (Total Metal)	8015B (GRO) / BTEX	8015B (DRO)								SOIL	OIL	GROUND WATER	AIR			TAT	Container(s) #	Container(s) Type	PRESERVATION	REMARKS

• TAT starts 8 a.m. following day if samples received after 3 p.m.

TAT: A= Overnight ≤ 24 hr B= Emergency Next workday C= Critical 2 Workdays D= Urgent 3 Workdays E= Routine 7 Workdays

Container Types: T=Tube V=VOA L=Liter P=Pint J=Jar B=Tedlar G=Glass P=Plastic M=Metal

Preservatives: H=Hcl N=HNO_3 S=H_2SO_4 C=4°C Z=$Zn(AC)_2$ O=NaOH T=$Na_2S_2O_3$

DISTRIBUTION: White with report, Yellow to folder, Pink to submitter.

Appendix F:
Tables of Instrument Calibration, Laboratory QC Procedures and Corrective Actions

Appendix F. Summary of Instrument Calibration, Laboratory QC Procedures and Corrective Actions.

Method EPA 8260B/EPA 624 (Volatile Organics by GC-MS)			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Check of mass spectral ion intensities using BFB	Prior to initial calibration and calibration verification	As listed in SW8260B	Evaluate system. Retune Instrument.
Five point calibration	Initial calibration prior to sample analysis	Bromoform, chloromethane, 1,1-dichloroethane ave. RF>0.1. All other SPCCs ave. RF≥0.30. For CCCs, %RSD ≤30.	Evaluate System. Repeat initial calibration.
		For Target Analytes: 1. **Ave of RF:** mean %RSD for all analytes ≤ 15% 2. **Linear Regression:** r^2=0.99	If mean %RSD exceeds 15%, choose linear regression.
Second Source calibration verification	With each initial calibration	Bromoform, chloromethane, 1,1-dichloroethane ave. RF>0.1. All other SPCCs ave. RF≥0.30. For CCCs, %RSD ≤20%.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and every 12 hours for Method 8260B and 24 hours for Method 624.	Bromoform, chloromethane, 1,1-dichloroethane ave. RF>0.1. All other SPCCs ave. RF≥0.30. For CCCs, %RSD ≤20%.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Internal Standards	Each calibration standard and sample	IS area for sample must be within –50% to + 200% of last calibration verification standard. IS RT for sample must be ± 30 seconds of the IS RT in calibration verification standard.	a.Check calculations, standard preparation, instrument malfunction and sample interferences. Rerun the sample. b. Recalibrate the instrument.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, recalibrate and reanalyze the entire batch.

Method EPA 8260B/EPA 624 (Volatile Organics by GC-MS) continued			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Retention time(RT) evaluation	Each sample	Relative retention time (RRT) within ± 0.06 units of RRT in continuing calibration standard.	Correct problem. Check for interferences. Reanalyze all affected samples.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Method EPA 8270C/625 (Semivolatile Organics by GC-MS			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Check of mass spectral ion intensities using DFTPP.	Prior to initial calibration and calibration verification	As listed in SW8270C	Evaluate system. Retune Instrument.
Five point calibration	Initial calibration prior to sample analysis	All SPCCs ave. RF≥0.050. and CCCs %RSD ≤30%.	Evaluate System. Repeat initial calibration.
		For Target Analytes: 1. **Ave of RF**: mean %RSD for all analytes ≤ 15%. For Method 625, all target analytes %RSD ≤ 35. 2. **Linear Regression:** r^2=0.99	If mean %RSD exceeds 15% for Method 8270C and 35% for Method 625,choose linear regression.
Second Source calibration verification	With each initial calibration	All SPCCs ave. RF≥0.050. and CCCs %RSD ≤20%	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and every 12 hours for Method 8270C and 24 hours for Method 625.	All SPCCs ave. RF≥0.050. and CCCs %RSD ≤30. For Method 625, all analytes must be ≤20%.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Internal Standards	Each calibration standard and sample	IS area for sample must be within –50% to + 200% of last calibration verification standard. IS RT for sample must be ± 30 seconds of the IS RT in calibration verification standard.	a.Check calculations, standard preparation, instrument malfunction and sample interferences. Rerun the sample. b. Recalibrate the instrument.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.

Method EPA 8270C/625 (Semivolatile Organics by GC-MS continued			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Retention time(RT) evaluation	Each sample	Relative retention time (RRT) within ± 0.06 units of RRT in continuing calibration standard.	Correct problem. Check for interferences. Reanalyze all affected samples.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Methods EPA 8015B (Total Volatile Petroleum Hydrocarbons by GC/FID [Gas])			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Five point calibration	Initial calibration prior to sample analysis	Ave RF: % RSD ≤ 20	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analyte within 15% of average RF.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analyte within 15% of average RF.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, re-prepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteriabatch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 8015B (Total Extractable Petroleum Hydrocarbons by GC/FID[Diesel])			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Five point calibration	Initial calibration prior to sample analysis	Ave RF: % RSD ≤ 20	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analyte within 15% of average RF.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analyte within 15% of average RF.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, re-prepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criterlabatch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 8021B ([BTEX + MTBE] Aromatic Halogenated Volatiles			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Five point calibration	Initial calibration prior to sample analysis	Ave RF: % RSD $\leq$ 20	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analyte within 15% of average RF.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analyte within 15% of average RF.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteriabatch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 8081A (Organochlorine Pesticides)			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Pesticide Evaluation Mix (Breakdown check using DDT and Endrin)	Prior to initial calibration and continuing calibration verification	Calculated % breakdown must be ≤ 15% for both Endrin and DDT.	Evaluate system. Perform maintenance. Re-analyze PEM.
Five point calibration	Initial calibration prior to sample analysis	1. **Ave RF:** % RSD ≤ 20 2. **Linear regression:** $r^2 > 0.99$ 3. **RSD Averaging:** Ave % RSD for all analytes including surrogates must be ≤ 20%.	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analytes within 15% of average RF or average of all % RSD for all analytes and surrogates is ≤ 15%.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analytes within 15% of average RF or average of all % RSD for all analytes and surrogates is ≤ 15%.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, rep-repare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 8082 (Polychlorinated Biphenyls [PCBs])			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Five point calibration	Initial calibration prior to sample analysis	1. **Ave RF:** % RSD $\leq$ 20 2. **Linear regression:** $r^2 > 0.99$ 3. **RSD Averaging:** Ave % RSD for all analytes including surrogates must be $\leq$ 20%.	Evaluate system. Repeat calibration.
Second Source calibration verification	With each initial calibration	RF for analytes within 15% of average RF or average of all % RSD for all analytes and surrogates is $\leq$ 15%.	Correct problem, then repeat initial calibration
Continuing Calibration Verification (CCV)	Beginning of each analytical sequence and after every 12 hours.	RF for analytes within 15% of average RF or average of all % RSD for all analytes and surrogates is $\leq$ 15%.	a. Evaluate system. Correct problem. Rerun standard. b. Reprep standards and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC critera batch is validated by the LCS.
Surrogate Spike	Added to every sample including standards and blanks prior to analysis.	In-house established limits.	a.Check for instrument malfunction. Check for sample interference. Re-extract and rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Method EPA 6010B (Metals by ICP) and 200.8(Metals by ICPMS).

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action
Initial Calibration	Initial calibration prior to sample analysis	r>0.995	Evaluate system. Repeat calibration.
Initial calibration verification (second source) ICV	With each initial calibration	Within 10% of expected value.	Correct problem, then repeat initial calibration
Initial Calibration Blank (ICB)/ Continuing Calibration Blank (CCB)	After initial calibration, every 10 samples, and at the end of analytical sequence.	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank
Interference Check Standard AB (ICSAB) (For ICP only)	At the beginning of analytical sequence.	Within 20% of expected value.	a.Investigate source of interference. Correct instrument if necessary and rerun ICSAB. b. Adjust interelement correction factors. Recalibrate the instrument.
Continuing calibration verification (CCV)	After every ten samples and at the end of the analytical sequence.	Recoveries within ± 10% of expected value.	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Internal Standard (200.8 only)	Added to every sample including standards and blanks prior to analysis.	60-125% of ICB's IS intensity	a.Check for instrument malfunction. Check for sample interference. Rerun the sample. b. Recalibrate the instrument.
MDL study	One per instrument per year.	For all analytes MDL should be <PQL.	Check instrument. Re-do MDL.

Advanced Technology Laboratories 3275 Walnut Avenue Signal Hill, CA 90755 Tel: 562-989-4045 Fax: 562-989-4040

EPA 7000 series(Metals by AA)			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Initial Calibration (minimum of 3 standards and a calibration blank)	Initial calibration prior to sample analysis	r > 0.995	Evaluate system. Repeat calibration.
Initial calibration verification (second source) ICV	With each initial calibration	Within 10% of expected value.	Correct problem, then repeat initial calibration
Initial Calibration Blank (ICB)/ Continuing Calibration Blank (CCB)	After initial calibration, every 10 samples, and at the end of analytical sequence.	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank
Continuing calibration verification (CCV)	After every ten samples and at the end of the analytical sequence.	Recoveries within ± 10% of expected value.	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < PQL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	In house established limits.	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	In-house established limits.	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
MDL study	One per instrument per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

EPA 300.0 (Inorganic Anions by IC)			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Initial Calibration (minimum of 3 standards and a calibration blank)	Initial calibration prior to sample analysis	r > 0.995	Evaluate system. Repeat calibration.
Initial calibration verification (second source) ICV	With each initial calibration	Within 10% of expected value.	Correct problem, then repeat initial calibration
Initial Calibration Blank (ICB)	After initial calibration, every 10 samples, and at the end of analytical sequence.	All analytes < RL.	Investigate source of contamination. Clean instrument if necessary and rerun blank
Continuing calibration verification (CCV)	After every ten samples and at the end of the analytical sequence.	Recoveries within ± 10% of expected value.	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	One per batch of 20 samples	All analytes < RL.	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Minimum of one LCS per batch of 20 samples.	80-120%	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	One MS/MSD per batch of 20 samples. Same spiking analytes as LCS.	80-120%	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
MDL study	Twice a year per instrument .	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Spectrophotometer Tests			
Calibration QC Check	**Frequency**	**Acceptance Criteria**	**Corrective Action**
Initial Calibration	Initial calibration prior to sample analysis	r > 0.995	Evaluate system. Repeat calibration.
Initial calibration verification (second source) ICV	With each initial calibration	Within 10% of expected value.	Correct problem, then repeat initial calibration
Continuing Calibration	Every 20 samples	± 10%	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	Every 20 samples	< PQL	Investigate source of contamination. Clean instrument if necessary and rerun blank.
Laboratory Control Sample (LCS)	Every 20 samples	80 – 120%	a.Check calculations. Check standards preparation. Check for instrument malfunction. Rerun the LCS. b. If out the second time, reprepare the entire batch.
Matrix spike/matrix spike duplicate (MS/MSD)	Every 20 samples	80-120%	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
MDL study	One for each test per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.
Titration Tests			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Titrant standardization	Every 20 samples	Within 5% of expected concentration	Check calculations and standard preparation. Reanalyze.
Method Blank	Every 20 samples	< PQL	Investigate source of contamination. Reanalyze.
Laboratory Control Sample (LCS)	Every 20 samples	80 – 120%	a.Check calculations. Check standards preparation. Rerun the LCS. b. All samples (including QC samples) must be reanalyze if LCS fails.
Matrix spike/matrix spike duplicate (MS/MSD)	Every 20 samples	80-120%	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.

pH			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Three Buffers	Beginning of use / new chemist	Within 0.1 unit of true value	Recalibrate instrument.
Buffer Check	Every 10 samples and at the end of the sample batch.	Within 0.1 unit of true value	Recalibrate instrument.
Duplicate	Every 10 samples	% RPD must be < current control limits	Reanalyze original sample and sample duplicate.
Gravimetric Tests			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Balance Check	Beginning of use.	Within current control limits.	Recalibrate instrument.
Method Blank	Every 20 samples	< PQL	Investigate source of contamination. Reanalyze.
Laboratory Control Sample (LCS)	Every 20 samples	80 – 120%	a.Check calculations. Check standards preparation. Rerun the LCS. b. All samples (including QC samples) must be reanalyze if LCS fails.
Matrix spike/matrix spike duplicate (MS/MSD)	Every 20 samples	80-120%	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS.
Sample Duplicate	Every 20 samples	RPD: 20%	Reanalyze original sample and sample duplicate.

Distillation Tests +Spectrophotometer Tests			
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**
Initial Calibration	Initial calibration prior to sample analysis	r > 0.995	Evaluate system. Repeat calibration.
Continuing Calibration	Every 20 samples	± 10%	a. Evaluate system. Rerun standard. b. Reprep standard and recalibrate. Rerun affected samples.
Method Blank	Every 20 samples	< PQL	Investigate source of contamination. Reanalyze.
Laboratory Control Sample (LCS)	Every 20 samples	80 – 120%	a.Check calculations. Check standards preparation. Rerun the LCS. b. All samples (including QC samples) must be reanalyze if LCS fails.
Matrix Spike / Matrix Spike Duplicate (MS/MSD)	Every 20 samples	80 – 120% (70-120%: sulfide)	Check for standards preparation. Check for interferences. Review against LCS recoveries to look for trends. If poor recovery is indicative of laboratory problems, re-prepare and re-analyze batch. Otherwise, if LCS passed QC criteria batch is validated by the LCS
MDL study	One for each test per year.	For all analytes MDL should be < PQL.	Check instrument. Re-do MDL.

Appendix G
Tables of Holding Times & Preservation

Holding Times and Preservation

Name	Container	Preservation	Maximum Holding Times
Inorganic Tests:			
Acidity	P, G	Cool, 4°C	14 days
Alkalinity	P, G	Cool, 4°C	14 days
Ammonia	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Biochemical Oxygen Demand	P, G	Cool, 4°C	48 hours
Bromide	P, G	None Required	28 days
Biochemical Oxygen Demand	P, G	Cool, 4°C	48 hours
Chemical Oxygen Demand	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Chloride	P, G	None Required	28 days
Chlorine, total residual	P, G	None Required	Analyze immediately
Color	P, G	Cool, 4°C	48 hours
Cyanide, total and amenable	P, G	Cool, 4°C, NaOH to pH>12, 0.6 g ascorbic acid	14 days
Fluoride	P, G	None Required	28 days
Hardness	P, G	HNO_3 to pH<2, H_2SO_4 to pH<2	6 months
pH	P, G	None Required	Analyze immediately
Kjeldahl and organic nitrogen	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Metals:			
Chromium VI	P, G	Cool, 4°C	24 hours
Mercury	P, G	HNO_3 to pH<2	28 days
Metals, except Chromium VI and Mercury	P, G	HNO_3 to pH<2	6 months
Nitrate	P, G	Cool, 4°C	48 hours
Nitrate-nitrite	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Nitrite	P, G	Cool, 4°C	48 hours
Oil and Grease	G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Organic carbon	P, G	Cool, 4°C, Hcl or H_2SO_4 to pH<2	28 days
Orthophosphate	P, G	Filter immediately, cool, 4°C	48 hours
Dissolved Oxygen	G	None Required	Analyze immediately
Phenols	G only	Cool, 4°C, H_2SO_4 to pH<2	28 days
Phosphorus (elemental)	G	Cool, 4°C	48 hours
Phosphorus, total	P, G	Cool, 4°C, H_2SO_4 to pH<2	28 days
Residue, total	P, G	Cool, 4°C	7 days
Residue, filterable	P, G	Cool, 4°C	7 days
Residue, nonfilterable (TSS)	P, G	Cool, 4°C	7 days
Residue, Settleable	P, G	Cool, 4°C	48 hours
Residue, Volatile	P, G	Cool, 4°C	7days
Silica	P	Cool, 4°C	28 days
Specific Conductance	P, G	Cool, 4°C	28 days
Sulfate	P, G	Cool, 4°C	28 days
Sulfide	P, G	Cool, 4°C, add zinc acetate plus sodium hydroxide to pH>9	7 days
Sulfite	P, G	None Required	Analyze immediately
Surfactants	P, G	Cool, 4°C	48 hours
Temperature	P, G	None Required	Analyze immediately
Turbidity	P, G	Cool, 4°C	48 hours
Organic Tests:			
Purgeable Halocarbons	G, Teflon-lined septum	Cool, 4°C	14 days
Purgeable Aromatic Hydrocarbons	G, Teflon-lined septum	Cool, 4°C,	14 days
Volatile Organics	G, Teflon-lined septum	Cool ,4°C, HCL to pH<2	14 days
Pesticides and PCB	G (amber), Teflon-lined cap	Cool, 4°C	7 days until extraction 40 days after extraction
Polynuclear Aromatic Hydrocarbons	G, Teflon-lined cap	Cool, 4°C, store in the dark	7 days until extraction 40 days after extraction
Base/Neutrals, Acids	G (amber), Teflon-lined cap	Cool, 4°C	7 days until extraction 40 days after extraction

Appendix H
ATL's Laboratory Certifications

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
NELAP - RECOGNIZED

ACCREDITATION

Is hereby granted to

ADVANCED TECHNOLOGY LABORATORIES

3275 WALNUT AVENUE

SIGNAL HILL, CA 90755

Scope of accreditation is limited to the
"NELAP Fields of Accreditation"
which accompanies this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No:	02107CA
Expiration Date:	05/31/2005
Effective Date:	05/31/2004

Berkeley, California
subject to forfeiture or revocation.

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

State of California—Health and Human Services Agency
Department of Health Services

SANDRA SHEWRY
Director

ARNOLD SCHWARZENEGGER
Governor

May 27, 2004

Certificate No.: 02107CA

EDUARDO RODRIGUEZ
ADVANCED TECHNOLOGY LABORATORIES
3275 WALNUT AVENUE
SIGNAL HILL, CA 90755

Dear EDUARDO RODRIGUEZ:

This is to advise you that the laboratory named above has been granted interim accreditation under National Environmental Laboratory Accreditation Program (NELAP) as an environmental testing laboratory pursuant to the provisions of the California Environmental Laboratory Improvement Act (Health and Safety Code (HSC), Division 101, Part 1, Chapter 4, Section 100825, et seq.).

The Fields of Accreditation for which this laboratory has been accredited under this Act are enclosed. Accreditation shall remain in effect until **May 31, 2005** or until full accreditation is granted, unless revoked or withdrawn at your written request. To obtain full accreditation and to ensure continuous accreditation, the laboratory shall comply with the National Environmental Laboratory Accreditation Conference (NELAC) Standards and all associated California Environmental Laboratory Accreditation Program (ELAP) regulations and statutes.

Please note that your laboratory is required to notify California ELAP of any major changes in key accreditation criteria within 30 calendar days of the change. This written notification includes but is not limited to changes in ownership, location, key personnel, and major instrumentation (Section 100845(b) and (d), HSC, and NELAC Standard Section 4.3.2). The certificate must be returned to California ELAP upon loss of accreditation.

Your continued cooperation is essential to maintain high quality of the data produced by environmental laboratories accredited by the State of California.

If you have any questions, please contact Rosalinda Lomboy at (213) 580-5731.

Sincerely,

George C. Kulasingam

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

Enclosure

CALIFORNIA DEPARTMENT OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED

FIELDS OF ACCREDITATION

ADVANCED TECHNOLOGY LABORATORIES — Lab Phone (562) 989-4045

3275 WALNUT AVENUE
SIGNAL HILL, CA 90755

Certificate No: 02107CA Renew Date: 05/31/2005 — INTERIM

103 - Toxic Chemical Elements of Drinking Water

103.140	002	EPA 200.8	Antimony
103.140	003	EPA 200.8	Arsenic
103.140	004	EPA 200.8	Barium
103.140	005	EPA 200.8	Beryllium
103.140	006	EPA 200.8	Cadmium
103.140	007	EPA 200.8	Chromium
103.140	008	EPA 200.8	Copper
103.140	009	EPA 200.8	Lead
103.140	012	EPA 200.8	Nickel
103.140	013	EPA 200.8	Selenium
103.140	014	EPA 200.8	Silver
103.140	015	EPA 200.8	Thallium
103.140	016	EPA 200.8	Zinc
103.160	001	EPA 245.1	Mercury

114 - Inorganic Chemistry of Hazardous Waste

114.010	001	EPA 6010B	Antimony
114.010	002	EPA 6010B	Arsenic
114.010	003	EPA 6010B	Barium
114.010	004	EPA 6010B	Beryllium
114.010	005	EPA 6010B	Cadmium
114.010	006	EPA 6010B	Chromium
114.010	007	EPA 6010B	Cobalt
114.010	008	EPA 6010B	Copper
114.010	009	EPA 6010B	Lead
114.010	010	EPA 6010B	Molybdenum
114.010	011	EPA 6010B	Nickel
114.010	012	EPA 6010B	Selenium
114.010	013	EPA 6010B	Silver
114.010	014	EPA 6010B	Thallium
114.010	015	EPA 6010B	Vanadium
114.010	016	EPA 6010B	Zinc
114.140	001	EPA 7470A	Mercury
114.141	001	EPA 7471A	Mercury

116 - Volatile Organic Chemistry of Hazardous Waste

116.030	001	EPA 8015B	Gasoline-range Organics
116.080	001	EPA 8260B	Acetone
116.080	003	EPA 8260B	Acrolein
116.080	004	EPA 8260B	Acrylonitrile
116.080	007	EPA 8260B	Benzene

As of: 06/04/2004, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

116.080	010	EPA 8260B	Bromochloromethane
116.080	011	EPA 8260B	Bromodichloromethane
116.080	012	EPA 8260B	Bromoform
116.080	013	EPA 8260B	Bromomethane
116.080	015	EPA 8260B	Carbon Disulfide
116.080	016	EPA 8260B	Carbon Tetrachloride
116.080	018	EPA 8260B	Chlorobenzene
116.080	019	EPA 8260B	Chloroethane
116.080	020	EPA 8260B	2-Chloroethyl Vinyl Ether
116.080	021	EPA 8260B	Chloroform
116.080	022	EPA 8260B	Chloromethane
116.080	026	EPA 8260B	Dibromochloromethane
116.080	027	EPA 8260B	Dibromochloropropane
116.080	028	EPA 8260B	1,2-Dibromoethane
116.080	030	EPA 8260B	Dibromomethane
116.080	031	EPA 8260B	1,2-Dichlorobenzene
116.080	032	EPA 8260B	1,3-Dichlorobenzene
116.080	033	EPA 8260B	1,4-Dichlorobenzene
116.080	036	EPA 8260B	Dichlorodifluoromethane
116.080	037	EPA 8260B	1,1-Dichloroethane
116.080	038	EPA 8260B	1,2-Dichloroethane
116.080	039	EPA 8260B	1,1-Dichloroethene
116.080	040	EPA 8260B	trans-1,2-Dichloroethene
116.080	041	EPA 8260B	cis-1,2-Dichloroethene
116.080	042	EPA 8260B	1,2-Dichloropropane
116.080	043	EPA 8260B	1,3-Dichloropropane
116.080	044	EPA 8260B	2,2-Dichloropropane
116.080	045	EPA 8260B	1,1-Dichloropropene
116.080	046	EPA 8260B	cis-1,3-Dichloropropene
116.080	047	EPA 8260B	trans-1,3-Dichloropropene
116.080	053	EPA 8260B	Ethylbenzene
116.080	056	EPA 8260B	Hexachlorobutadiene
116.080	064	EPA 8260B	Methyl tert-butyl Ether (MTBE)
116.080	065	EPA 8260B	Methylene Chloride
116.080	081	EPA 8260B	1,1,1,2-Tetrachloroethane
116.080	082	EPA 8260B	1,1,2,2-Tetrachloroethane
116.080	083	EPA 8260B	Tetrachloroethene
116.080	084	EPA 8260B	Toluene
116.080	086	EPA 8260B	1,2,3-Trichlorobenzene
116.080	087	EPA 8260B	1,2,4-Trichlorobenzene
116.080	088	EPA 8260B	1,1,1-Trichloroethane
116.080	089	EPA 8260B	1,1,2-Trichloroethane
116.080	090	EPA 8260B	Trichloroethene
116.080	091	EPA 8260B	Trichlorofluoromethane
116.080	092	EPA 8260B	1,2,3-Trichloropropane
116.080	093	EPA 8260B	Vinyl Acetate
116.080	094	EPA 8260B	Vinyl Chloride
116.080	095	EPA 8260B	Xylenes, Total

117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	EPA 8015B	Diesel-range Total Petroleum Hydrocarbons
117.110	001	EPA 8270C	Acenaphthene
117.110	002	EPA 8270C	Acenaphthylene
117.110	007	EPA 8270C	Aniline
117.110	008	EPA 8270C	Anthracene
117.110	010	EPA 8270C	Benzidine
117.110	011	EPA 8270C	Benz(a)anthracene
117.110	012	EPA 8270C	Benzo(b)fluoranthene
117.110	013	EPA 8270C	Benzo(k)fluoranthene
117.110	014	EPA 8270C	Benzo(g,h,i)perylene
117.110	015	EPA 8270C	Benzo(a)pyrene
117.110	016	EPA 8270C	Benzoic Acid
117.110	018	EPA 8270C	Benzyl Alcohol
117.110	019	EPA 8270C	Benzyl Butyl Phthalate
117.110	020	EPA 8270C	Bis(2-chloroethoxy)methane
117.110	021	EPA 8270C	Bis(2-chloroethyl) Ether
117.110	022	EPA 8270C	Bis(2-chloroisopropyl) Ether
117.110	023	EPA 8270C	Di(2-ethylhexyl) Phthalate
117.110	024	EPA 8270C	4-Bromophenyl Phenyl Ether
117.110	026	EPA 8270C	4-Chloroaniline
117.110	027	EPA 8270C	4-Chloro-3-methylphenol
117.110	029	EPA 8270C	2-Chloronaphthalene
117.110	030	EPA 8270C	2-Chlorophenol
117.110	031	EPA 8270C	4-Chlorophenyl Phenyl Ether
117.110	032	EPA 8270C	Chrysene
117.110	036	EPA 8270C	Dibenz(a,h)anthracene
117.110	037	EPA 8270C	Dibenzofuran
117.110	039	EPA 8270C	1,2-Dichlorobenzene
117.110	040	EPA 8270C	1,3-Dichlorobenzene
117.110	041	EPA 8270C	1,4-Dichlorobenzene
117.110	042	EPA 8270C	3,3'-Dichlorobenzidine
117.110	043	EPA 8270C	2,4-Dichlorophenol
117.110	045	EPA 8270C	Diethyl Phthalate
117.110	053	EPA 8270C	2,4-Dimethylphenol
117.110	054	EPA 8270C	Dimethyl Phthalate
117.110	055	EPA 8270C	Di-n-butyl phthalate
117.110	056	EPA 8270C	Di-n-octyl phthalate
117.110	060	EPA 8270C	2,4-Dinitrophenol
117.110	061	EPA 8270C	2,4-Dinitrotoluene
117.110	062	EPA 8270C	2,6-Dinitrotoluene
117.110	064	EPA 8270C	1,2-Diphenylhydrazine
117.110	067	EPA 8270C	Fluoranthene
117.110	068	EPA 8270C	Fluorene
117.110	069	EPA 8270C	Hexachlorobenzene
117.110	070	EPA 8270C	Hexachlorobutadiene
117.110	071	EPA 8270C	Hexachlorocyclopentadiene
117.110	072	EPA 8270C	Hexachloroethane

117.110	075	EPA 8270C	Indeno(1,2,3-c,d)pyrene
117.110	076	EPA 8270C	Isophorone
117.110	080	EPA 8270C	2-Methyl-4,6-dinitrophenol
117.110	083	EPA 8270C	2-Methylnaphthalene
117.110	084	EPA 8270C	2-Methylphenol
117.110	086	EPA 8270C	4-Methylphenol
117.110	087	EPA 8270C	Naphthalene
117.110	092	EPA 8270C	2-Nitroaniline
117.110	093	EPA 8270C	3-Nitroaniline
117.110	094	EPA 8270C	4-Nitroaniline
117.110	095	EPA 8270C	Nitrobenzene
117.110	096	EPA 8270C	2-Nitrophenol
117.110	097	EPA 8270C	4-Nitrophenol
117.110	100	EPA 8270C	N-nitrosodimethylamine
117.110	101	EPA 8270C	N-nitrosodi-n-propylamine
117.110	102	EPA 8270C	N-nitrosodiphenylamine
117.110	110	EPA 8270C	Pentachlorophenol
117.110	112	EPA 8270C	Phenanthrene
117.110	113	EPA 8270C	Phenol
117.110	119	EPA 8270C	Pyrene
117.110	120	EPA 8270C	Pyridine
117.110	129	EPA 8270C	1,2,4-Trichlorobenzene
117.110	130	EPA 8270C	2,4,5-Trichlorophenol
117.110	131	EPA 8270C	2,4,6-Trichlorophenol
117.210	001	EPA 8081A	Aldrin
117.210	002	EPA 8081A	a-BHC
117.210	003	EPA 8081A	b-BHC
117.210	004	EPA 8081A	d-BHC
117.210	005	EPA 8081A	g-BHC (Lindane)
117.210	007	EPA 8081A	a-Chlordane
117.210	008	EPA 8081A	g-Chlordane
117.210	009	EPA 8081A	Chlordane (tech.)
117.210	013	EPA 8081A	4,4'-DDD
117.210	014	EPA 8081A	4,4'-DDE
117.210	015	EPA 8081A	4,4'-DDT
117.210	020	EPA 8081A	Dieldrin
117.210	021	EPA 8081A	Endosulfan I
117.210	022	EPA 8081A	Endosulfan II
117.210	023	EPA 8081A	Endosulfan Sulfate
117.210	024	EPA 8081A	Endrin
117.210	025	EPA 8081A	Endrin Aldehyde
117.210	026	EPA 8081A	Endrin Ketone
117.210	027	EPA 8081A	Heptachlor
117.210	028	EPA 8081A	Heptachlor Epoxide
117.210	033	EPA 8081A	Methoxychlor
117.210	039	EPA 8081A	Toxaphene
117.220	001	EPA 8082	PCB-1016
117.220	002	EPA 8082	PCB-1221

As of 06/04/2004, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

117.220	003	EPA 8082	PCB-1232
117.220	004	EPA 8082	PCB-1242
117.220	005	EPA 8082	PCB-1248
117.220	006	EPA 8082	PCB-1254
117.220	007	EPA 8082	PCB-1260

As of 06/04/2004, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

California Department of Health Services

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

ENVIRONMENTAL LABORATORY CERTIFICATION

Is hereby granted to

ADVANCED TECHNOLOGY LABORATORIES

3275 WALNUT AVENUE

SIGNAL HILL, CA 90755

Scope of certification is limited to the
"List of Approved Fields of Testing and Analytes"
which accompanies this Certificate.

Continued certification status depends on successful completion of site visit, proficiency testing studies, and payment of applicable fees.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No:	1838
Expiration Date:	12/31/2004
Effective Date:	12/01/2002

Berkeley, California
subject to forfeiture or revocation.

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
Accredited Fields of Testing

ADVANCED TECHNOLOGY LABORATORIES
3275 WALNUT AVENUE
SIGNAL HILL, CA 90755

Lab Phone (562) 989-4045

Certificate No: 1838 Renew Date: 12/31/2004

Field of Testing: 02 - Inorganic Chemistry and Physical Properties of Drinking Water		
02.01	00	Alkalinity
02.02	00	Calcium
02.03	00	Chloride
02.05	00	Fluoride
02.06	00	Hardness
02.07	00	Magnesium
02.08	00	MBAS
02.09	00	Nitrate
02.10	00	Nitrite
02.11	00	Sodium
02.12	00	Sulfate
02.13A	00	Total Dissolved Solids
02.13B	00	Conductivity
02.16	00	Phosphate, Ortho
02.17	00	Silica
02.18	00	Cyanide
02.19	00	Potassium
02.24	00	Perchlorate
02.24	00	Perchlorate
02.25	00	Combined & Total Chlorine
02.27	00	Chlorine Dioxide
02.29	00	Total Organic Carbon
Field of Testing: 03 - Analysis of Toxic Chemical Elements in Drinking Water		
03.01	00	Arsenic
03.02	00	Barium
03.03	00	Cadmium
03.04	00	Chromium, Total
03.05	00	Copper
03.06	00	Iron
03.07	00	Lead
03.08	00	Manganese
03.09	00	Mercury
03.10	00	Selenium
03.11	00	Silver
03.12	00	Zinc
03.13	00	Aluminum
03.15	00	Antimony
03.16	00	Beryllium
03.17	00	Nickel
03.18	00	Thallium
03.20	00	Boron
03.21	00	Vanadium
Field of Testing: 09 - Physical Properties Testing of Hazardous Waste		
09.01	00	Ignitability

As of 12/30/2003, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

09.02	00	Corrosivity - pH Determination	
09.04	00	Reactivity	Section 7.3 SW-846
Field of Testing: 10 - Inorganic Chemistry and Toxic Chemical Elements of Hazardous Waste			
10.01	00	Antimony	
10.02	00	Arsenic	
10.03	00	Barium	
10.04	00	Beryllium	
10.05	00	Cadmium	
10.06	00	Chromium, Total	
10.07	00	Cobalt	
10.08	00	Copper	
10.09	00	Lead	
10.10	00	Mercury	
10.11	00	Molybdenum	
10.12	00	Nickel	
10.13	00	Selenium	
10.14	00	Silver	
10.15	00	Thallium	
10.16	00	Vanadium	
10.17	00	Zinc	
10.18	00	Chromium (VI)	
10.19	00	Cyanide	
10.20	00	Fluoride	
10.21	00	Sulfide	
Field of Testing: 11 - Extraction Tests of Hazardous Waste			
11.01	01	Waste Extraction Test (WET)	CCR Chapter11, Article 5, Appendix II
11.03	01	Toxicity Characteristic Leaching Procedure (TCLP)	EPA 1311
Field of Testing: 12 - Organic Chemistry of Hazardous Waste by GC/MS			
12.03A	01	Extractable Organics	EPA 8270C
12.06A	01	Volatile Organic Compounds	EPA 8260B
12.06B	01	Oxygenates	EPA 8260B
Field of Testing: 13 - Organic Chemistry of Hazardous Waste (excluding GC/MS)			
13.02A	01	Ethanol and Methanol	EPA 8015B
13.15	01	Total Petroleum Hydrocarbons - Gasoline	LUFT
13.16	01	Total Petroleum Hydrocarbons - Diesel	LUFT
13.17	01	TRPH Screening	EPA 418.1
13.19C	01	BTEX	EPA 8021B
13.24C	01	PCBs	EPA 8082
13.25C	01	Organochlorine Pesticides	EPA 8081A
Field of Testing: 16 - Wastewater Inorganic Chemistry, Nutrients and Demand			
16.01	00	Acidity	
16.02	00	Alkalinity	
16.03	00	Ammonia	
16.04	00	Biochemical Oxygen Demand	
16.05	00	Boron	
16.06	00	Bromide	
16.07	00	Calcium	
16.08	00	Carbonaceous BOD	
16.09	00	Chemical Oxygen Demand	
16.10	00	Chloride	
16.11	00	Chlorine Residual, Total	
16.12	00	Cyanide	

As of 12/30/2003, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

16.13	00	Cyanide, amenable	
16.14	00	Fluoride	
16.15	00	Hardness - Total as CaCO3	
16.16	00	Kjeldahl Nitrogen	
16.17	00	Magnesium	
16.18	00	Nitrate	
16.19	00	Nitrite	
16.20	00	Oil and Grease	
16.20	03	Oil and Grease	EPA 1664
16.21	00	Total Organic Carbon	
16.22	00	Oxygen,dissolved	
16.23	00	pH	
16.24	00	Phenols	
16.25	00	Phosphate, Ortho	
16.26	00	Phosphorus, Total	
16.27	00	Potassium	
16.28	00	Residue, Total	
16.29	00	Residue, Filterable	
16.30	00	Residue, Non-filterable	
16.31	00	Residue, Settleable	
16.32	00	Residue, Volatile	
16.34	00	Sodium	
16.35	00	Conductivity	
16.36	00	Sulfate	
16.37	00	Sulfide	
16.39	00	Surfactants	
16.41	00	Turbidity	
16.45	00	Total Organic Halides	

Field of Testing: 17 - Toxic Chemical Elements in Wastewater

17.01	00	Aluminum
17.02	00	Antimony
17.03	00	Arsenic
17.04	00	Barium
17.05	00	Beryllium
17.06	00	Cadmium
17.07	00	Chromium (VI)
17.08	00	Chromium, Total
17.09	00	Cobalt
17.10	00	Copper
17.13	00	Iron
17.14	00	Lead
17.15	00	Manganese
17.16	00	Mercury
17.17	00	Molybdenum
17.18	00	Nickel
17.24	00	Selenium
17.25	00	Silver
17.27	00	Thallium
17.28	00	Tin
17.29	00	Titanium
17.30	00	Vanadium
17.31	00	Zinc

Field of Testing: 18 - Organic Chemistry of Wastewater by GC/MS

18.01	01	All Volatile Organics	EPA 624
18.02	01	All Acid/base/neutral Compounds	EPA 625
Field of Testing: 19 - Organic Chemistry of Wastewater (excluding GC/MS)			
19.02	01	Aromatic Volatiles	EPA 602
19.08A	01	Organochlorine Pesticides	EPA 608
19.08B	01	PCBs	EPA 608

As of 12/30/2003, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

Appendix I
Fax Cover Page

Advanced Technology
Laboratories

3275 Walnut Avenue
Signal Hill CA 90807
(562) 989-4045 Phone
(562) 989-4040 Fax

RECEIVED
SEP 2 4 2004

Fax Transmittal Sheet

To:

From:

RE:

Message:

Halpern, Ron

From: Bing Roura [bing@atlglobal.com]
Sent: Monday, January 10, 2005 2:19 PM
To: Halpern, Ron
Subject: RE: Acceptance criteria for Instrument Calibration - 8260B

Hi, Ron,

Happy New Year! I'm looking forward to a better new year.

With regards to your project - I have attached the MS/MSD, Surrogates and LCS criteria. As for the instrument calibration, here are the acceptance criteria for 8260B.

Five compounds (the System Performance Check Compounds, or SPCC's) are checked for a minimum average response factor. The SPCC's criteria are as follows:

SPCC Compound	Minimum Acceptable Average RF
Chloromethane	0.100
1,1-Dichloroethane	0.100
Bromoform	0.100
1,1,2,2-Tetrachloroethane	0.300
Chlorobenzene	0.300

Using the RFs from the initial calibration, calculate the percent relative standard deviation (%RSD) for the Calibration Check Compounds (CCCs). The CCCs criteria are as follows:

CCC Compounds	Acceptable %RSD
1,1-Dichloroethene	< 30%
Chloroform	< 30%
1,2-Dichloropropane	< 30%
Toluene	< 30%
Ethylbenzene	< 30%
Vinyl Chloride	< 30%

The RSD should be less than or equal to 15% for each target analyte. However, the RSD for each individual CCC must be equal or less than 30%.

If the response factor for any individual analyte does not meet the %RSD acceptance criteria, alternate initial calibration criteria may be used such as

a. RSD Averaging

b. Linear Regression greater than or equal to 0.99.

Other Alternatives SW-846 describes the use of other alternative initial calibration acceptability such as quadratic equations.

Please let me know if these are what you need.

Thanks,
Bing

-----Original Message-----
From: Halpern, Ron [mailto:RHalpern@arcadis-us.com]
Sent: Monday, January 10, 2005 12:45 PM
To: Bing Roura
Cc: Johnsen, John
Subject: Acceptance criteria for Instrument Calibration - 8260B

Hey there Bing.
Long time....Hope you had a great holiday season and new year!
Bing, EPA is requesting actual acceptance criteria for instrument calibration for 8260B (this is for that superfund project). In ATL's QAPP, Appendix F, it states "In House established limits under the acceptance criteria for the LCS, MS/MSD, and surrogate spike. Do you have any recent numbers, or established limits? Could you get this to me by tomorrow morning? Thanks

Re the superfund project, it will probably go ahead in mid February. We will likely have ATL do the 8260B quick turn around. Will let you know.

Ronald Halpern, RG
Project Scientist
ARCADIS - Los Angeles
1400 N. Harbor Boulevard, Suite 700
Fullerton, California 92835
Tel 714.278.0992 x 3052 Fax 714.278.0051
Cell (949) 294-1532

8260B _ VOC

Matrix: **SOIL**

MS/MSD / **RPD**

Analyte	Lower Limit	Upper Limit	Limit
1,1-Dichloroethene	51	128	30
Benzene	65	136	30
Chlorobenzene	52	152	30
MTBE	60	143	30
Toluene	56	142	30
Trichloroethene	54	155	30

LCS

Analyte	Lower Limit	Upper Limit
1,1-Dichloroethene	63	127
Benzene	88	126
Chlorobenzene	91	133
MTBE	69	130
Toluene	87	126
Trichloroethene	86	134

Surrogate

Analyte	Lower Limit	Upper Limit
1,2-Dichloroethane-d4	61	164
Dibromofluoromethane	78	141
Toluene-d8	86	123
4-Bromofluorobenzene	80	123

Effective September 29, 2004

EMAX

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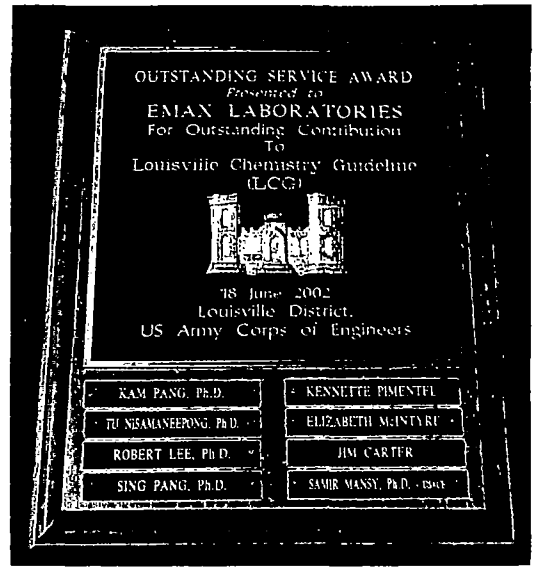


QUALITY ASSURANCE MANUAL, PT RESULTS AND MDL/RLs

Submitted To:	*Prepared By:*
Mr. Ron Halpern **Arcadis** **1400 N. Harbor Boulevard, Suite 700** **Fullerton, CA 92835**	**EMAX Laboratories, Inc.** **1835 W. 205th Street** **Torrance, California 90501** **Telephone: (310) 618-8889**

TABLE OF CONTENTS

Testimonials on EMAX Laboratories, Inc.

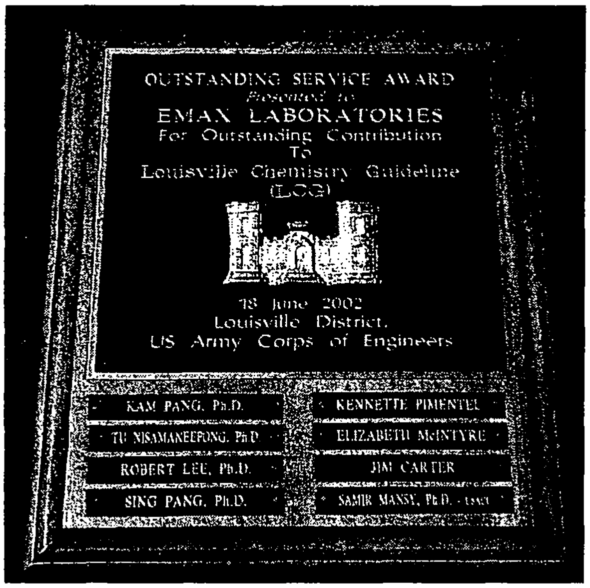
EPA Region 9, Vance Fong, Marlon Mezquita, Joseph Eidelberg

To EMAX Laboratory Management,

"We appreciate your consistent and diligent efforts over the last three years to make this contract work for both USEPA Region IX and your laboratory. You have exceeded our expectations in many instances. The data you have provided the Agency has been invaluable... and your timeliness helped us to better protect the health and safety of our environment.

You facilitated our environmental work by consistently providing friendly service, routinely accommodating EPA expedited sampling schedules, and quickly answering questions regarding new analytical methods performance and/or detection levels.

EMAX demonstrated it's seriousness in meeting EPA's QA/QC requirements specified in the contract by various actions, most impressive was that of implementing a colored coded files system to clearly identify and track projects throughout the laboratory as an effort to ensure that method performance would be in accordance with EPA project specific requirements. Additionally, we were pleased with EMAX's responsiveness to EPA data validation questions, and how EMAX provided any necessary material to help us complete data validation in a timely manner."



EMAX was awarded this placque recognizing our Outstanding Contribution to the Louisville Chemistry Guideline (LCG). Dr. Samir Mansy, Quality Assurance Manager for the Louisville Army Corps of Engineers, presented this Outstanding Service Award to EMAX on June 18, 2002.

EMAX was asked by Dr. Mansy to assist him with the Section 5.0 Manual Integration portion of the LCG. ***EMAX*** also provided extensive review and comment to make the document as good as possible.

EMAX is known industry-wide as a leader in high quality services providing data that meets data quality objectives.

Schofield/Makua Military Reserve, ACOE 12/02

Hello Richard,
I have received the data packages for the Hawaii work and we have processed the EDD's. I wish to thank you and the EMAX staff for the nice job in performing per the scope of services...Thanks again and Merry Christmas

John W. Yaremchuk
QA Chemist, CESPK-ED-EC
U.S. Army Corps of Engineers
Sacramento District
1325 J Street
Sacramento, CA 95814-2922

Marine Corps Air Station, Navy 1996-2002

I just happened to check my email on Saturday and I was surprised to see my results. Thanks for getting them back so quickly. I thought I would take this opportunity to tell you and the others working on the Tustin project that your performance has been excellent. I've been in the environmental business since 1986 and have worked with several labs. EMAX and their personnel are the best I've worked with. EMAX makes TAT, the data makes sense, and if there are any anomalies, they have the staff to help answer the questions. Thanks again.

Chris Johnson
Tech Lead
Shaw E&I
MCAS Tustin

From: Susan Seckman [mailto:sseckman@wibby.com]., Provider of PT check samples
Sent: Wednesday, April 09, 2003 9:15 AM
To: Kenette Pimentel
Subject: RE: WP 0103 Final PT Report

Kenette -

I wanted to congratulate your laboratory for it's excellent performance in this study. You appear to have an outstanding technical facility as is routinely demonstrated in your PT scores. Your overall acceptable rating for WP 0103 was 93.7% which was one of the highest rated scores for a full service laboratory.

Keep up the great work.
Sincerely,

Susan Seckman
Manager of Quality Assurance
sseckman@wibby.com

Vandenberg AFB, AFCEE Prime Contractor

"...You're absolutely right, these are the first VOCs we've run on the range projects. You guys have to be the most pro-active lab I've ever come across! -- I really appreciate your attention to detail and project requirements, you make my job much easier."

Tetra Tech EM Inc.

135 Main Street, Suite 1800 ◆ San Francisco, CA 94105 ◆ (415) 543-4880 ◆ FAX (415) 543-5480

Kam Pang
EMAX Laboratories, Inc.
1835 W. 205th Street
Torrance, California 90501

Friday, October 29, 2004

Subject: Letter of Recommendation

Dear Dr. Pang:

I am pleased to provide this letter of recommendation to EMAX Laboratories, Inc. based on your support of our work for clients such as the U.S. Navy.

As you know, your lab has been under contract with us since 2001, and we recently exercised the Option Year II extending the contract through 2005. Over the last three years, you have helped further our work by successful analyzing more than a thousand samples. Your data undergoes our evaluation and validation and it has consistently met the data quality objectives.

Tetra Tech EM Inc. has looked to EMAX to support some of our most demanding and challenging projects, including investigation and remediation projects at Hunters Point, China Lake, Lemoore, Mare Island, Treasure Island, and even Torii Station in Japan.

We appreciate the responsive service we have received over the years from EMAX and look forward to a [illegible] bright future together.

Sincerely,
Tetra Tech EM Inc.

Edward H Sussenguth
Operations Manager

ARCADIS

Table 3. Measurement Performance Criteria
Quality Assurance Project Plan, Omega OU-2

Parameter	Method	Target Detection Limit	Analytical Accuracy (%Recovery)	Analytical Precision (Relative % Deviation)	Overall Completeness (%)
Volatile Organic Compounds					
TCL Volatile Organic Compounds (VOCs) plus MTBE [a]	EPA 8260B	(c)	70-130/CLP	±30/CLP	90
TCL [a] Semivolatile Organic Compounds (SVOCs)	EPA 8270C	(c)	CLP		
		? GLYPHOSATE ?	DLS FOR PAH'S ?		
Emergent Compounds					
1,4-Dioxane	EPA 8720 [b]	1 μg/L	40-130	±30	90
SUB - NDMA	Mod. EPA 1625[b]	0.02 μg/L	50-125	±30	90
Perchlorate	EPA 314 [b,d]	5 μg/L	50-150	±50	90
Hexavalent Chromium	EPA 218.6 [b,d]	0.2 μg/L	70-140	±30	90
SUB - 1,2,3 TCP	(i)	0.005 μg/L	(i)	(i)	90
Groundwater Treatment and Discharge Parameters					
TAL [a] Metals (field filtered)	EPA 6010/7000				
Boron	EPA 200.8 [d,b]	(g)	70-130	±30	90
Silicon	EPA 245.1/CLP	? MERCURY ?			
Cyanide	EPA 335.4 [d,b]	10 mg/L	75-125	±25	90
Bromide	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Chloride	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Fluoride	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Nitrate-N	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Nitrite-N	EPA 300.0 [d,b]	0.1 mg/L	75-125	±25	90
Orthophosphate-P	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Total Sulfate	EPA 300.0 [d,b]	1.0 mg/L	75-125	±25	90
Total Kjeldahl Nitrogen (TKN)	EPA 351.2 [d,b]	1.0 mg/L	75-125	±25	90
Ammonia	EPA 350.2 [d,b]	0.3 mg/L	75-125	±25	90
Total Phosphorus	EPA 365.4 [d,b]	0.3 mg/L	75-125	±25	90
Total Dissolved Solids (TDS)	EPA 160.1 [d,b]	20 mg/L	75-125	±25	90
Alkalinity	SM 2320B [b,e]	20 mg/L	75-125	±25	90
Total Organic Carbon	EPA 415.1 [d]	2.0 mg/L	75-125	±30	90

ARCADIS

Table 3. Measurement Performance Criteria
Quality Assurance Project Plan, Omega OU-2

Parameter	Method	Target Detection Limit	Analytical Accuracy (%Recovery)	Analytical Precision (Relative % Deviation)	Overall Completeness (%)
BOD	SM 5210B [e]	3mg/L	75-125	±25	90
COD	SM 5220D [e]	5.0 mg/L	75-125	±30	90
Field Analysis for Volatile Organics	(i)	(j)	(j)	(j)	90

[a] Target Compound List (TCL) and Target Analyte List (TAL) as shown in Table 2
MTBE: methyl tert butyl ether.

[b] Volatile organics, semivolatile organics, metals and cyanide may be analyzed by the EPA Contract Laboratory Program (CLP) Statement of Work or the equivalent EPA Regional Laboratory Standard Operating Procedures, depending on availability.

[c] For volatile organics, detection limits will be at 1 part per billion (ppb) for all except 0.5 ppb for vinyl chloride, carbon tetrachloride, 1,2 dichloroethane, cis and trans-1,3-dichloropropene, and 2 ppb for 1,2-dibromo-3-chloropropene.

ALL BY 8260B
RUN CALI @ 0.5
INC. 1,2-DB-3-CP
@ 2 ppb

[d] U.S. Environmental protection Agency, 1979. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983; U.S. Environmental Protection Agency, Test Methods for Evaluating Solid Waste, SW846.

[e] Standard Methods for the Examination of Water and Wastewater, 17th Edition (1989).

[f] State of California Department of Health Services (DHS) method Determination of Perchlorate by Ion Chromatography, as detailed in EPA Region IX SOP in Appendix B.

[g] Slica by EPA 200.7 and will have a detection level <0.1 part per million (ppm). - By 200.8/6020 ICPMS

[h] Target detection level is reporting level, see text for explanation.

[i] The method and QA/QC will follow California State guidance to achieve the needed low regulatory limit. Laboratory-specific standard operating procedures will be defined prior to start of work, and subsequent to selection of laboratory.

[j] Volatile organics to be analyzed in the field will be the same list as the offsite laboratory analyses (a), target detection levels will also be equivalent to the offsite laboratory analyses. Method will be based on 8260/GC/MS. Method and field laboratory-specific standard operating procedures will be defined prior to start of work.

SUMMARY OF MDL RL QC LIMITS

8260B LOW TARGET ANALYTE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
1	1,1,1-Trichloroethane	0.2	1	ug/L			
2	1,1,2,2-Tetrachloroethane	0.2	1	ug/L			
3	1,1,2-Trichloroethane	0.2	1	ug/L			
4	1,1-Dichloroethane	0.2	1	ug/L			
5	1,1-Dichloroethene	0.2	1	ug/L	60 - 130	54 - 143	30
6	1,2-Dichloroethane	0.2	1	ug/L			
7	1,2-Dichloropropane	0.2	1	ug/L			
8	2-Butanone (MEK)	5	10	ug/L			
9	2-Hexanone	5	10	ug/L			
10	4-Methyl-2-Pentanone (MIBK)	5	10	ug/L			
11	Acetone	5	10	ug/L			
12	Benzene	0.2	1	ug/L	70 - 130	63 - 143	30
13	Bromodichloromethane	0.2	1	ug/L			
14	Bromoform	0.3	1	ug/L			
15	Bromomethane	0.2	1	ug/L			
16	Carbon Disulfide	0.2	1	ug/L			
17	Carbon Tetrachloride	0.2	1	ug/L			
18	Chlorobenzene	0.2	1	ug/L	70 - 120	63 - 132	30
19	Chloroethane	0.2	1	ug/L			
20	Chloroform	0.2	1	ug/L			
21	Chloromethane	0.2	1	ug/L			
22	cis-1,2-Dichloroethene	0.2	1	ug/L			
23	cis-1,3-Dichloropropene	0.2	1	ug/L			
24	Dibromochloromethane	0.2	1	ug/L			
25	Ethylbenzene	0.2	1	ug/L			
26	m,p-Xylene	0.5	2	ug/L			
27	Methylene Chloride	0.5	1	ug/L			
28	MTBE	0.2	1	ug/L			
29	o-Xylene	0.2	1	ug/L			
30	Styrene	0.2	1	ug/L			
31	Tetrachloroethene	0.2	1	ug/L			
32	Toluene	0.2	1	ug/L	70 - 130	63 - 143	30

8260B LOW		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
33	trans-1,2-Dichloroethene	0.2	1	ug/L			
34	trans-1,3-Dichloropropene	0.2	1	ug/L			
35	Trichloroethene	0.2	1	ug/L	70 - 130	63 - 143	30
36	Vinyl Chloride	0.2	1	ug/L			
SURROGATE							
1	1,2-Dichloroethane-d4				70 - 130	63 - 143	
2	4-Bromofluorobenzene				70 - 130	63 - 143	
3	Toluene-d8				70 - 130	63 - 143	

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

8260B ENCORE TARGET ANALYTE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
1	1,1,1-Trichloroethane	2	5	ug/Kg			
2	1,1,2,2-Tetrachloroethane	2	5	ug/Kg			
3	1,1,2-Trichloroethane	2	5	ug/Kg			
4	1,1-Dichloroethane	2	5	ug/Kg			
5	1,1-Dichloroethene	2	5	ug/Kg	60 - 140	54 - 154	50
6	1,2-Dichloroethane	2	5	ug/Kg			
7	1,2-Dichloropropane	2	5	ug/Kg			
8	2-Butanone (MEK)	5	10	ug/Kg			
9	2-Hexanone	5	10	ug/Kg			
10	4-Methyl-2-Pentanone (MIBK)	5	10	ug/Kg			
11	Acetone	5	10	ug/Kg			
12	Benzene	2	5	ug/Kg	70 - 130	63 - 143	50
13	Bromodichloromethane	2	5	ug/Kg			
14	Bromoform	2	5	ug/Kg			
15	Bromomethane	2	10	ug/Kg			
16	Carbon Disulfide	2	5	ug/Kg			
17	Carbon Tetrachloride	2	5	ug/Kg			
18	Chlorobenzene	2	5	ug/Kg	70 - 130	63 - 143	50
19	Chloroethane	2	5	ug/Kg			
20	Chloroform	2	5	ug/Kg			
21	Chloromethane	2	10	ug/Kg			
22	cis-1,2-Dichloroethene	2	5	ug/Kg			
23	cis-1,3-Dichloropropene	2	5	ug/Kg			
24	Dibromochloromethane	2	5	ug/Kg			
25	Ethylbenzene	2	5	ug/Kg			
26	m,p-Xylene	2	10	ug/Kg			
27	Methylene Chloride	2	10	ug/Kg			
28	MTBE	2	5	ug/Kg			
29	o-Xylene	2	5	ug/Kg			
30	Styrene	2	5	ug/Kg			
31	Tetrachloroethene	2	5	ug/Kg			
32	Toluene	2	5	ug/Kg	70 - 130	63 - 143	50

8260B ENCORE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
33	trans-1,2-Dichloroethene	2	5	ug/Kg			
34	trans-1,3-Dichloropropene	2	5	ug/Kg			
35	Trichloroethene	2	5	ug/Kg	70 - 130	63 - 143	50
36	Vinyl Chloride	2	5	ug/Kg			
SURROGATE							
1	1,2-Dichloroethane-d4				60 - 140	54 - 154	
2	4-Bromofluorobenzene				70 - 130	63 - 143	
3	Toluene-d8				70 - 130	63 - 143	

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

504.1		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	DBCP	0	0.05	ug/L	50 - 150	45 - 165	20
2	EDB	0	0.05	ug/L	50 - 150	45 - 165	20
SURROGATE							
1	TCX				50 - 150	45 - 165	

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

RSK-175 TARGET ANALYTE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
1	Ethane	0.6	2	ug/L	60 - 140	54 - 154	30
2	Ethylene	0.6	2	ug/L	60 - 140	54 - 154	30
3	Methane	0.6	2	ug/L	50 - 140	45 - 154	30

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

8270C TARGET ANALYTE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
1	1,2,4-Trichlorobenzene	5	10	ug/L	30 - 130	27 - 143	30
2	1,2-Dichlorobenzene	5	10	ug/L			
3	1,3-Dichlorobenzene	5	10	ug/L			
4	1,4-Dichlorobenzene	5	10	ug/L	30 - 130	27 - 143	30
5	2,4,5-Trichlorophenol	5	10	ug/L			
6	2,4,6-Trichlorophenol	5	10	ug/L			
7	2,4-Dichlorophenol	5	10	ug/L			
8	2,4-Dimethylphenol	5	10	ug/L			
9	2,4-Dinitrophenol	5	20	ug/L			
10	2,4-Dinitrotoluene	5	10	ug/L	50 - 130	45 - 143	30
11	2,6-Dinitrotoluene	5	10	ug/L			
12	2-Chloronaphthalene	5	10	ug/L			
13	2-Chlorophenol	5	10	ug/L	30 - 130	27 - 143	30
14	2-Methylnaphthalene	5	10	ug/L			
15	2-Methylphenol	5	10	ug/L			
16	2-Nitroaniline	5	10	ug/L			
17	2-Nitrophenol	5	10	ug/L			
18	3,3'-Dichlorobenzidine	5	10	ug/L			
19	3-Nitroaniline	5	10	ug/L			
20	4,6-Dinitro-2-methylphenol	5	20	ug/L			
21	4-Bromophenyl-phenylether	5	10	ug/L			
22	4-Chloro-3-methylphenol	5	10	ug/L	40 - 130	36 - 143	30
23	4-Chloroaniline	5	10	ug/L			
24	4-Chlorophenyl-phenylether	5	10	ug/L			
25	4-Methylphenol	5	10	ug/L			
26	4-Nitroaniline	5	10	ug/L			
27	4-Nitrophenol	5	20	ug/L	40 - 130	36 - 143	30
28	Acenaphthene	5	10	ug/L	40 - 130	36 - 143	30
29	Acenaphthylene	5	10	ug/L			
30	Anthracene	5	10	ug/L			
31	Benzo(a)anthracene	5	10	ug/L			
32	Benzo(a)pyrene	5	10	ug/L			

8270C TARGET ANALYTE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
33	Benzo(b)fluoranthene	5	10	ug/L			
34	Benzo(g,h,i)perylene	5	10	ug/L			
35	Benzo(k)fluoranthene	5	10	ug/L			
36	Bis(2-chloroethoxy)methane	5	10	ug/L			
37	Bis(2-chloroethyl)ether	5	10	ug/L			
38	Bis(2-chloroisopropyl)ether	5	10	ug/L			
39	Bis(2-ethylhexyl)phthalate	5	10	ug/L			
40	Butylbenzylphthalate	5	10	ug/L			
41	Chrysene	5	10	ug/L			
42	Di-n-butylphthalate	5	10	ug/L			
43	Di-n-octylphthalate	5	10	ug/L			
44	Dibenzo(a,h)anthracene	5	10	ug/L			
45	Dibenzofuran	5	10	ug/L			
46	Diethylphthalate	5	10	ug/L			
47	Dimethylphthalate	5	10	ug/L			
48	Fluoranthene	5	10	ug/L			
49	Fluorene	5	10	ug/L			
50	Hexachlorobenzene	5	10	ug/L			
51	Hexachlorobutadiene	5	10	ug/L			
52	Hexachlorocyclopentadiene	5	10	ug/L			
53	Hexachloroethane	5	10	ug/L			
54	Indeno(1,2,3-cd)pyrene	5	10	ug/L			
55	Isophorone	5	10	ug/L			
56	n-Nitroso-di-n-propylamine	5	10	ug/L	40 - 130	36 - 143	30
57	n-Nitrosodiphenylamine	5	10	ug/L			
58	Naphthalene	5	10	ug/L			
59	Nitrobenzene	5	10	ug/L			
60	Pentachlorophenol	5	20	ug/L	40 - 130	36 - 143	30
61	Phenanthrene	5	10	ug/L			
62	Phenol	5	10	ug/L	30 - 130	27 - 143	30
63	Pyrene	5	10	ug/L	40 - 130	36 - 143	30

SURROGATE

8270C		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
SURROGATE							
1	2,4,6-Tribromophenol				40 - 130	36 - 143	
2	2-Fluorobiphenyl				40 - 130	36 - 143	
3	2-Fluorophenol				40 - 130	36 - 143	
4	Nitrobenzene-d5				40 - 130	36 - 143	
5	Phenol-d5				40 - 130	36 - 143	
6	Terphenyl-d14				50 - 130	45 - 143	

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

8270SIM		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Acenaphthene	0.2	1	ug/L	40 - 130	36 - 143	30
2	Acenaphthylene	0.2	1	ug/L			
3	Anthracene	0.2	1	ug/L			
4	Benzo(a)anthracene	0.2	1	ug/L			
5	Benzo(a)pyrene	0.2	1	ug/L			
6	Benzo(b)fluoranthene	0.2	1	ug/L			
7	Benzo(g,h,i)perylene	0.2	1	ug/L			
8	Benzo(k)fluoranthene	0.2	1	ug/L			
9	Chrysene	0.2	1	ug/L			
10	Dibenzo(a,h)anthracene	0.2	1	ug/L			
11	Fluoranthene	0.2	1	ug/L			
12	Fluorene	0.2	1	ug/L			
13	Indeno(1,2,3-cd)pyrene	0.2	1	ug/L			
14	Naphthalene	0.2	1	ug/L			
15	Phenanthrene	0.2	1	ug/L			
16	Pyrene	0.2	1	ug/L	40 - 130	36 - 143	30
SURROGATE							
1	Terphenyl-d14				50 - 130	45 - 143	

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

8270SIM DIOXANE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	1,4-Dioxane	0.6	1	ug/L	30 - 130	27 - 143	30
SURROGATE							
1	Bromobenzene				40 - 140	36 - 154	30

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

218.6		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Hexavalent Chromium	0.1	0.2	ug/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

314.0		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Perchlorate	0.5	2	ug/L	85 - 115	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

415.1		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	TOC	0.5	1	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

405.1 TARGET ANALYTE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
1	BOD	1	2	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

410.4		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	COD	5	10	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

6020A		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Aluminum	50	100	ug/L	80 - 120	75 - 125	20
2	Antimony	0.5	1	ug/L	80 - 120	75 - 125	20
3	Arsenic	0.5	1	ug/L	80 - 120	75 - 125	20
4	Barium	0.5	1	ug/L	80 - 120	75 - 125	20
5	Beryllium	0.5	1	ug/L	80 - 120	75 - 125	20
6	Cadmium	0.5	1	ug/L	80 - 120	75 - 125	20
7	Calcium	50	100	ug/L	80 - 120	75 - 125	20
8	Chromium	0.5	1	ug/L	80 - 120	75 - 125	20
9	Cobalt	0.5	1	ug/L	80 - 120	75 - 125	20
10	Copper	0.5	1	ug/L	80 - 120	75 - 125	20
11	Iron	50	100	ug/L	80 - 120	75 - 125	20
12	Lead	0.5	1	ug/L	80 - 120	75 - 125	20
13	Magnesium	50	100	ug/L	80 - 120	75 - 125	20
14	Manganese	0.5	1	ug/L	80 - 120	75 - 125	20
15	Nickel	0.1	1	ug/L	80 - 120	75 - 125	20
16	Potassium	50	100	ug/L	80 - 120	75 - 125	20
17	Selenium	0.5	1	ug/L	80 - 120	75 - 125	20
18	Silver	0.5	1	ug/L	80 - 120	75 - 125	20
19	Sodium	50	100	ug/L	80 - 120	75 - 125	20
20	Thallium	0.5	1	ug/L	80 - 120	75 - 125	20
21	Vanadium	0.5	1	ug/L	80 - 120	75 - 125	20
22	Zinc	5	10	ug/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

7470A		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Mercury	0.1	0.5	ug/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

7470A		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Mercury	0.1	0.5	ug/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

335.2		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Cyanide	0.005	0.01	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

370.1		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Silica	1	2	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

351.3		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Nitrogen (TKN)	0.035	0.1	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: STANDARD

SUMMARY OF MDL RL QC LIMITS

350.2		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Ammonia	0.03	0.1	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: MASTER

SUMMARY OF MDL RL QC LIMITS

310.1		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Alkalinity	1	5	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: MASTER

SUMMARY OF MDL RL QC LIMITS

130.2 TARGET ANALYTE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
1	Hardness	5	10	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: MASTER

SUMMARY OF MDL RL QC LIMITS

300.0 TARGET ANALYTE		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
1	Bromide	0.1	0.5	mg/L	90 - 110	80 - 120	20
2	Chloride	0.1	0.2	mg/L	90 - 110	80 - 120	20
3	Fluoride	0.05	0.1	mg/L	90 - 110	80 - 120	20
4	Nitrate-N	0.05	0.1	mg/L	90 - 110	80 - 120	20
5	Nitrite-N	0.05	0.1	mg/L	90 - 110	80 - 120	20
6	Phosphate-P	0.25	0.5	mg/L	90 - 110	80 - 120	20
7	Sulfate	0.25	0.5	mg/L	90 - 110	80 - 120	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: MASTER

SUMMARY OF MDL RL QC LIMITS

365.2		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	Phosphorus (Total)	0.02	0.1	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: MASTER

SUMMARY OF MDL RL QC LIMITS

160.1		MDL	RL	UNIT	LCS QCL (%R)	MS QCL (%R)	RPD
TARGET ANALYTE							
1	TDS	5	10	mg/L	80 - 120	75 - 125	20

Comment: The RL and QCL specified in this document is the in-house default value. The contract takes precedence in the event that the project specifies the required RL and QC Limits.

MDL: Method Detection Limit
RL: Reporting Limit
LCS: Lab Control Sample
MS/MSD: Matrix Spike/Matrix Spike Duplicate
QCL: Quality Control Limits
%R: Percent Recovery
Notes:
MS Surrogate QCL also applies to field samples.

Target List: MASTER

TETRA TECH, INC.
4213 State Street, Suite 100
Santa Barbara, California 93110-2847
Telephone (805) 681-3100
Fax (805) 681-3108

03 November 2004

To Whom It May Concern:

Tetra Tech, Inc. is pleased to provide this letter highly recommending EMAX for laboratory analytical services. EMAX Laboratories, Inc. has provided environmental sample analysis for Tetra Tech, Inc. from May 2003 to present for groundwater sampling of over 250 wells on 19 IRP sites beginning in May 2004 for Vandenberg Air Force Base under our Basewide Groundwater Monitoring Program. EMAX Laboratories was selected from several subcontractors to perform all of the analytical services for this program based on superior performance on analytical services conducted beginning in 2003. In addition, EMAX provided investigation derived waste (IDW) sample analysis from May 2002 through March 2003. Their responsibilities include providing laboratory analysis under the AFCEE QAPP 3.1, laboratory logins, electronic data deliverables including Geotracker, and analytical result reports all within a timely manner. During the course of their subcontract agreements with us, EMAX Laboratories has demonstrated outstanding performance.

Their electronic data deliverables are nearly flawless and their work has always been completed on or before contractual deadlines, resulting in cost savings for our project. The laboratory has consistently scored above the 95 percentile in double blind performance evaluation testing. EMAX staff has been extremely responsive to Tetra Tech's analytical needs, special requests, and quality assurance follow-up correspondence.

Based on their performance, Tetra Tech presented EMAX with the full incentive fee in accordance with the Incentive Fee Clause of our subcontract agreement.

If you have any questions or need more information, please feel free to contact Jennifer Higgins or Michelle Stedman at (805) 681-3100, by Fax at (805) 681-3108, or by email at jennifer.higgins@tetratech.com or michelle.stedman@tetratech.com.

Sincerely,

TETRA TECH, INC.

JHiggins

Jennifer Higgins, P.E. No. 58000
Deputy Project Manager

EMAX QUALITY SYSTEMS

EMAX LABORATORIES, INC.

1835 205th St., Torrance, CA 90501

Tel. #: 310-618-8889

FAX #: 310-618-0818

Email: info@emaxlabs.com

Website: www.emaxlabs.com

BROWSER

Approved By	Kenette Pimentel	07.11.02	
	QA Manager	Date	
Approved By	Kam Pang	7/11/02	
	Laboratory Director	Date	

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QUALITY SYSTEMS

INTRODUCTION

The Quality Systems of EMAX Laboratories, Inc. include all quality assurance (QA) policies and quality control (QC) procedures. The Quality Systems are designed to ensure that the analytical data produced by EMAX can be documented as meeting high professional standards, including conformance to the National Environmental Laboratory Analysis Program (NELAP) Standards as a minimum. All EMAX Quality Systems shall provide sufficient detail to ensure that consistency and uniformity can be achieved.

This manual is organized according to the structure of NELAP Quality Systems, Revision 12, July 1999. Where EMAX has determined that supplementary information is appropriate, this manual contains that information in addition to information derived from NELAC Quality Systems, Revision 12.

All items identified in this Quality Manual shall be available for on-site inspection or data audit.

This manual is considered confidential within EMAX. The Quality Manual is available for use by the laboratory personnel through the EMAX browser and by means of controlled distribution. The procedure for controlled distribution of this manual is detailed in EMAX-DM02, Controlled Documents. The manual must not be altered other than by a duly authorized representative of EMAX.

If the document has been provided to external users or regulators, it is for the exclusive purpose of reviewing EMAX quality systems. The external party(ies) shall not use it in any other way without the prior written permission of an authorized representative of EMAX Laboratories, Inc.

1.0 SCOPE

EMAX Quality Systems set the general requirements for EMAX competently to carry out all of the specified environmental testing activities it undertakes.

The Quality Systems include requirements and information for assessing professional competence or complying with NELAP Standards.

If more stringent standards or requirements are included in a mandated test method or by regulation, EMAX shall demonstrate that such requirements are met. If it is not clear which requirements are more stringent, the standard from the method or regulation is to be followed.

The Quality Manual describes EMAX's overall management commitment to the Quality Systems. The QA Manager maintains the Quality Manual. The manual is reviewed annually and revisions are issued as appropriate to keep it up to date. All revisions to the manual are recorded in the revision history. Retention time for obsolete versions is at least 5 years.

2.0 REFERENCES

- NELAP QUALITY SYSTEMS MANUAL REVISION 12 – 1 JULY 1999
- DOD QUALITY SYSTEMS MANUAL – VERSION 1 FINAL
- 40 CFR PART 136, APPENDIX A, PARAGRAPHS 8.1.1 AND 8.2
- EPA 2185 - GOOD AUTOMATED LABORATORY PRACTICES, 1995 AVAILABLE AT WWW.EPA.GOV/DOCS/ETSDWE1/IRM_GALP/ and sometimes referred to herein as "GALP"
- "GLOSSARY OF QUALITY ASSURANCE TERMS AND ACRONYMS", QUALITY ASSURANCE DIVISION, OFFICE OF RESEARCH AND DEVELOPMENT, USEPA
- "GUIDANCE ON THE EVALUATION OF SAFE DRINKING WATER ACT COMPLIANCE MONITORING RESULTS FROM PERFORMANCE BASED METHODS", SEPTEMBER 30, 1994, SECOND DRAFT.
- MANUAL FOR THE CERTIFICATION OF LABORATORIES ANALYZING DRINKING WATER, REVISION 4, EPA 815-B-97-001
- PERFORMANCE BASED MEASUREMENT SYSTEM, EPA EMMC METHOD PANEL, PBMS WORKGROUP, 1996

3.0 DEFINITIONS

Acceptance Criteria: Specified limits placed on characteristics of an item, process, or service defined in requirement documents. (ASQC)

Accreditation: The process by which an agency or organization evaluates and recognizes a laboratory as meeting certain predetermined qualifications or standards, thereby accrediting the laboratory. In the context of the National Environmental Laboratory Accreditation Program (NELAP), this process is a voluntary one. (NELAC)

Accrediting Authority: The Territorial, State, or Federal agency having responsibility and accountability for environmental laboratory accreditation and which grants accreditation. (NELAC)

Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator. (QAMS)

Aliquot: A discrete, measured, representative portion of a sample taken for analysis. (Team, EPA QAD Glossary)

Analysis Duplicate: The second measurement of the target analyte(s) performed on a single sample or sample preparation.

Analyst: The designated individual who performs the "hands-on" analytical methods and associated techniques and who is the one responsible for applying required laboratory practices and other pertinent quality controls to meet the required level of quality. (NELAC)

Analytical Reagent (AR) Grade: Designation for the high purity of certain chemical reagents and solvents given by the American Chemical Society. (Quality Systems)

Assessment: The evaluation process used to measure or establish the performance, effectiveness, and conformance of an organization and/or its systems to defined criteria.

Analyte: The specific chemicals or components for which a sample is analyzed; may be a group of chemicals that belong to the same chemical family, and which are analyzed together. (EPA Risk Assessment Guide for Superfund; OSHA Glossary)

Audit: A systematic evaluation to determine the conformance to quantitative and qualitative specifications of some operational function or activity. (EPA-QAD)

Batch: Environmental samples, which are prepared and/or analyzed together with the same process and personnel, using the same lot(s) of reagents. A **preparation batch** is composed of one to 20 environmental samples of the same matrix, meeting the above mentioned criteria and with a maximum time between the start of processing of the first and last sample in the batch to be 24 hours. An **analytical batch** is composed of prepared environmental samples (extracts, digestates or concentrates) and/or those samples not requiring preparation, which are analyzed together as a group using the same calibration curve or factor. An analytical batch can include samples originating from various environmental matrices and can exceed 20 samples.

Blank: A sample that has not been exposed to the analyzed sample stream in order to monitor contamination during sampling, transport, storage or analysis. The blank is subjected to the usual analytical and measurement process to establish a zero baseline or background value and is sometimes used to adjust or correct routine analytical results. (ASQC)

Blind Sample: A subsample for analysis with a composition known to the submitter. The analyst/ laboratory may know the identity of the sample but not its composition. It is used to test the analyst's or laboratory's proficiency in the execution of the measurement process. (NELAC)

Calibrate: To determine, by measurement or comparison with a standard, the correct value of each scale reading on a meter or other device, or the correct value for each setting of a control knob. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration: The set of operations which establish, under specified conditions, the relationship between values indicated by a measuring device, or the correct value of each setting of a control knob. The levels of the applied calibration standard should bracket the range of planned or expected sample measurements. (NELAC)

Calibration Curve: The graphical relationship between the known values, such as concentrations, of a series of calibration standards and their analytical response. (NELAC)

Calibration Method: A defined technical procedure for performing a calibration. (NELAC)

Calibration Standard: A substance or reference material used to calibrate an instrument. (QAMS)

Certified Reference Material (CRM): A reference material one or more of whose property values are certified by a technically valid procedure, accompanied by or traceable to a certificate or other documentation which is issued by a certifying body. (ISO Guide 30 - 2.2)

Chain of Custody: An unbroken trail of accountability that ensures the physical security of samples, and includes the signatures of all who handled the samples.

Chemical: Any element, compound, or mixture of elements and/or compounds. Frequently, chemical substances are classified by the CAS rules of nomenclature for the purposes of identification for a hazard evaluation. (OSHA Glossary)

Client: The party that has agreed to pay the bill for services rendered by the laboratory, and with whom the laboratory has a contractual relationship for that project. For a laboratory, this is typically the prime contractor who originally hires the laboratory for the project, and who signs the contract as the receiver of services and resulting data. In cases where the laboratory has a direct contractual relationship with DoD, the client is the Government, with the Government's authorized contracting officer as its representative. The contracting officer shall consult with the Government's authorized technical representative when dealing with laboratory technical issues. It is understood that typically other "Clients" are present at other levels of the project, but they may be removed from the day-to-day decision-making (for example, installation representatives, service center representatives, various other Government officials). Specific circumstances may require the direct notification of these other clients, in addition to the prime contractor or DoD representative; these circumstances shall be included as part of specific project requirements. (Team)

Compound: A unique combination of chemical elements, existing in combination to form a single chemical entity. (Team)

Component: A single chemical entity, such as an element or compound. Multiple components may compose one analyte. (OSHA Glossary, Team)

Compromised Samples: Those samples which are improperly sampled, insufficiently documented (chain of custody and other sample records and/or labels), improperly preserved, collected in improper containers, or exceeding holding times when delivered to a laboratory. Under normal conditions compromised samples are not analyzed. If emergency situations require analysis, the results must be appropriately qualified. (NELAC)

Confirmation: Verification of the presence/identity of a component that may include (NELAC):

- Second column confirmation;
- Alternate wavelength;
- Derivatization;
- Mass spectral interpretation;
- Alternative detectors;
- Additional cleanup procedures, or;
- Alternative technique or conditions.

Conformance: An affirmative indication or judgment that a product or service has met the requirements of the relevant specifications, contract, or regulation; also the state of meeting the requirements. (ANSI/ ASQC E4-1994)

Consensus Standards: A protocol established by a recognized authority (for example, American Society for Testing and Materials [ASTM], American National Standards Institute [ANSI], or the Institute for Electrical and Electronic Engineers [IEEE]).

Corrective Action: Action taken to eliminate the causes of an existing nonconformity, defect or other undesirable situation in order to prevent recurrence. (ISO 8402)

Data Audit: A qualitative and quantitative evaluation of the documentation and procedures associated with environmental measurements to verify that the resulting data are of acceptable quality (i.e., that they meet specified acceptance criteria). (NELAC)

Data Reduction: The process of transforming raw data by arithmetic or statistical calculations, standard curves, concentration factors, etc., and collation into a more useful form. (EPA-QAD).

Deficiency: An unauthorized deviation from acceptable procedures or practices, or a defect in an item. (ASQC)

Demonstration of Capability: A procedure to establish the ability of the analyst to generate acceptable accuracy. (NELAC)

Desorption Efficiency: The mass of target analyte recovered from sampling media, usually a sorbent tube, divided by the mass of target analyte spiked on to the sampling media expressed as a percentage. Sample target analyte masses are usually adjusted for the desorption efficiency. (NELAC)

Detection Limit: The lowest concentration or amount of the target analyte that can be determined to be different from zero by a single measurement at a stated degree of confidence. See Method Detection Limit, Quantitation Limit, and Limit of Detection. (NELAC)

Document Control: The act of ensuring that documents (and revisions thereto) are proposed, reviewed for accuracy, approved for release by authorized personnel, distributed properly and controlled to ensure use of the correct version at the location where the prescribed activity is performed. (ASQC)

Duplicate Analyses: The analyses or measurements of the variable of interest performed identically on two subsamples of the same sample. The results from duplicate analyses are used to evaluate analytical or measurement precision but not the precision of sampling, preservation or storage internal to the laboratory. (EPA- QAD)

Environmental Program: An organized effort that assesses environmental concerns and leads to the collection of data, either in the field or through laboratory analysis. (Variation on EPA QAD Glossary for Terms: Environmentally related measurement, environmental sample)

Holding Times (Maximum Allowable Holding Times): The maximum times that samples may be held prior to analysis and still be considered valid. (40 CFR Part 136)

Inspection: An activity such as measuring, examining, testing, or gauging one or more characteristics of an entity and comparing the results with specified requirements in order to establish whether conformance is achieved for each characteristic. (ANSI/ ASQC E4-1994)

Internal Standard: A known amount of standard added to a test portion of a sample as a reference for evaluating and controlling the precision and bias of the applied analytical method. (NELAC)

Instrument Blank: A clean sample (e.g., distilled water) processed through the instrumental steps of the measurement process; used to determine instrument contamination. (EPA-QAD)

Definitive Data: Data that are generated using rigorous analytical methods, such as approved EPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. Methods produce tangible raw data in the form of paper printouts or electronic files. Data shall satisfy QA/QC requirements. For data to be definitive, either analytical or total measurement error shall be determined and documented. (Data Quality Objectives Process for Superfund)

Holding Times (DoD Clarification): The time elapsed from the time of sampling to the time of extraction or analysis, as appropriate.

Laboratory: A body that calibrates and/or tests.

1. In cases where a laboratory forms part of an organization that carries out other activities besides calibration and testing, the term "laboratory" refers only to those parts of that organization that are involved in the calibration and testing process.

2. As used herein, the term "laboratory" refers to a body that carries out calibration or testing at or from a permanent location, from a temporary facility, or a mobile facility. (ISO 25)

Laboratory Control Sample (however named, such as laboratory fortified blank or spiked blank): A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes from a source independent of the calibration standards or a material containing known and verified amounts of analytes. It is generally used to establish intra-laboratory or analyst-specific precision and bias or to assess the performance of all or a portion of the measurement system. (NELAC).

Laboratory Duplicate: Aliquots of a sample taken from the same container under laboratory conditions and processed and analyzed independently.

Limit of Detection (LOD): The lowest concentration level that can be determined by a single analysis and with a defined level of confidence to be statistically different from a blank. See also Method Detection Limit, Detection Limit, and Quantitation Limit (Analytical Chemistry, 55, p. 2217, December 1983, modified)

Manager (however named): The individual designated as being responsible for the overall operation, all personnel, and the physical plant of the environmental laboratory. A supervisor may report to the manager. In some cases, the supervisor and the manager may be the same individual. (NELAC)

Matrix: The component or substrate that may contain the analyte of interest. For purposes of batch determination, the following matrix types shall be used:

- Aqueous: Any aqueous sample excluded from the definition of a drinking water matrix or saline/estuarine source. Includes surface water, groundwater and effluents.
- Drinking Water: Any aqueous sample that has been designated a potable or potential potable water source.
- Saline/Estuarine: Any aqueous sample from an ocean or estuary, or other salt water source such as the Great Salt Lake.
- Non-aqueous Liquid: Any organic liquid with <15% settleable solids.
- Biological Tissue: Any sample of a biological origin such as fish tissue, shellfish, or plant material. Such samples shall be grouped according to origin.
- Solids: Includes soils, sediments, sludges and other matrices with >15% settleable solids.
- Chemical Waste: A product or by-product of an industrial process that results in a matrix not previously defined.
- Air: Whole gas or vapor samples including those contained in flexible or rigid wall containers and the extracted concentrated analytes of interest from a gas or vapor that are collected with a sorbent tube, impinger solution, filter or other device.

Key Staff: At a minimum, the following managerial and supervisory staff (however named) – executive staff (for example, Chief Executive Officer, Chief Operating Officer, laboratory director, technical director); technical directors/supervisors (for example, section supervisors for organics and inorganics); quality assurance systems directors/supervisors (for example, QA officer, quality auditors); and support systems directors/supervisors (for example, information systems supervisor, purchasing director, project manager).

Matrix Spike (spiked sample, fortified sample): Prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. Matrix spikes are used, for example, to determine the effect of the matrix on a method's recovery efficiency. (QAMS)

Matrix Spike Duplicate (spiked sample/fortified sample duplicate): A second replicate matrix spike is prepared in the laboratory and analyzed to obtain a measure of the precision of the recovery for each analyte. (QAMS)

May: Denotes permitted action, but not required action. (NELAC)

Media: Material that supports the growth of a microbiological culture.

Method Blank: A sample of a matrix similar to the batch of associated samples (when available) in which no target analytes or interferences are present at concentrations that impact the analytical results. It is processed simultaneously with samples of similar matrix and under the same conditions as the samples. (NELAC)

Method Detection Limit: The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. (40 CFR Part 136 Appendix B)

Must: Denotes a requirement (mandatory). (Random House College Dictionary)

National Environmental Laboratory Accreditation Conference (NELAC): A voluntary organization of State and Federal environmental officials and interest groups purposed primarily to establish mutually acceptable standards for accrediting environmental laboratories. A subset of NELAP. (NELAC)

National Environmental Laboratory Accreditation Program (NELAP): The overall National Environmental Laboratory Accreditation Program of which NELAC is a part. (NELAC)

Negative Control: Measures taken to ensure that a test, its components, or the environment do not cause undesired effects, or produce incorrect test results. (NELAC)

Objective Evidence: Any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity, based on observations, measures, or tests that can be verified. (ASQC)

Performance Audit: The routine comparison of independently obtained qualitative and quantitative measurement system data with routinely obtained data in order to evaluate the proficiency of an analyst or laboratory. (NELAC)

Performance Based Measurement System (PBMS): A set of processes wherein the data quality needs, mandates or limitations of a program or project are specified and serve as criteria for selecting appropriate test methods to meet those needs in a cost-effective manner. (NELAC)

Positive Control: Measures taken to ensure that a test and/or its components are working properly and producing correct or expected results from positive test subjects. (NELAC)

Nonconformance: An indication or judgment that a product or service has not met the requirements of the relevant specifications, contract or regulation; also the state of failing to meet the requirements.

Precision: The degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves; a data quality indicator. Precision is usually expressed as standard deviation, variance or range, in either absolute or relative terms. (NELAC)

Preservation: Refrigeration and or reagents added at the time of sample collection (or later) to maintain the chemical and or biological integrity of the sample. (NELAC)

Proficiency Test Sample (PT): A sample, the composition of which is unknown to the analyst and is provided to test whether the analyst/laboratory can produce analytical results within specified acceptance criteria. (QAMS)

Proficiency Testing: A means of evaluating a laboratory's performance under controlled conditions relative to a given set of criteria through analysis of unknown samples provided by an external source. (NELAC Section 2.1]

Proficiency Testing Program: The aggregate of providing rigorously controlled and standardized environmental samples to a laboratory for analysis, reporting of results, statistical evaluation of the results and the collective demographics and results summary of all participating laboratories. (NELAC)

Protocol: A detailed written procedure for field and/or laboratory operation (e.g., sampling, analysis) which must be strictly followed. (EPA-QAD)

Pure Reagent Water: Shall be water (defined by national or international standard) in which no target analytes or interferences are detected as required by the analytical method. (NELAC)

Quality Assurance: An integrated system of activities involving planning, quality control, quality assessment, reporting and quality improvement to ensure that a product or service meets defined standards of quality with a stated level of confidence. (QAMS)

Quality Assurance (Project) Plan (QAPP): A formal document describing the detailed quality control procedures by which the quality requirements defined for the data and decisions pertaining to a specific project are to be achieved. (EPA-QAD)

Quality Control: The overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. (QAMS)

Quality Control Sample: An uncontaminated sample matrix with known amounts of analytes from a source independent from the calibration standards. It is generally used to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. (EPA-QAD)

Quality Manual: A document stating the quality policy, quality system and quality practices of an organization. This may also be called a Quality Assurance Plan or Quality Plan.

NOTE – The quality manual may call up other documentation relating to the laboratory's quality arrangements.

Quality System: A structured and documented management system describing the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan of an organization for ensuring quality in its work processes, products (items), and services. The quality system provides the framework for planning, implementing, and assessing work performed by the organization and for carrying out required QA and QC. (ANSI/ ASQC E-41994)

Quantitation Limits: The maximum or minimum levels, concentrations, or quantities of a target that can be quantified with the accuracy required by the intended use of the data user. (NELAC)

Quantitation Limits (DoD Clarification): The value at which an instrument can accurately measure an analyte at a specific concentration (i.e., a specific numeric concentration can be quantified). These points are established by the upper and lower limits of the calibration range.

Range: The difference between the minimum and the maximum of a set of values. (EPA-QAD)

Raw Data: Any original factual information from a measurement activity or study recorded in a laboratory notebook, worksheets, records, memoranda, notes, or exact copies thereof that are necessary for the reconstruction and evaluation of the report of the activity or study. Raw data may include photography, microfilm or microfiche copies, computer printouts, magnetic media, including dictated observations, and recorded data from automated instruments. If exact copies of raw data have been prepared (e.g., tapes which have been transcribed verbatim, data and verified accurate by signature), the exact copy or exact transcript may be submitted. (EPA-QAD)

Reagent Blank (method reagent blank): A sample consisting of reagent(s), without the target analyte or sample matrix, introduced into the analytical procedure at the appropriate point and carried through all subsequent steps to determine the contribution of the reagents and of the involved analytical steps. (QAMS)

Record Retention: The systematic collection, indexing and storing of documented information under secure conditions. (EPA-QAD)

Reference Material: A material or substance one or more properties of which are sufficiently well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials. (ISO Guide 30- 2.1)

Reference Method: A method of known and documented accuracy and precision issued by an organization recognized as competent to do so. (NELAC)

Reference Standard: A standard, generally of the highest metrological quality available at a given location, from which measurements made at that location are derived. (VIM-6.08)

Replicate Analyses: The measurements of the variable of interest performed identically on two or more sub-samples of the same sample within a short time interval. (NELAC)

Reporting Limit: A specific concentration at or above the lower quantitation limit that is reported to the client with confidence. It is often defined on a project-specific basis. If set by the client below the lower quantitation limit, method modification is required or the client will be required to accept the lowest technically valid value that can be provided by the laboratory. For methods that require only one standard (for example, lower limit of calibration curve is the origin), the reporting limit shall be no lower than the low-level check standard.

Requirement: Denotes a mandatory specification; often designated by the term "shall". (NELAC)

Sample – Portion of material collected for chemical analysis, identified by a single, unique alphanumeric code. A sample may consist of portions in multiple containers, if a single sample is submitted for multiple or repetitive analysis.

Sampling Media: Material used to collect and concentrate the target analyte(s) during air sampling such as solid sorbents, filters, or impinger solutions.

Selectivity: (Analytical chemistry) The capability of a test method or instrument to respond to a target substance or constituent in the presence of nontarget substances.

Sensitivity: The capability of a test method or instrument to discriminate between measurement responses representing different levels (e.g., concentrations) of a variable of interest.

Shall: Denotes a requirement that is mandatory whenever the criterion for conformance with the specification requires that there be no deviation. This does not prohibit the use of alternative approaches or methods for implementing the specification so long as the requirement is fulfilled. (ANSI)

Should: Denotes a guideline or recommendation whenever noncompliance with the specification is permissible. (ANSI)

Spike: A known mass of target analyte added to a blank, sample or subsample; used to determine recovery efficiency or for other quality control purposes.

Standard: The document describing the elements of laboratory accreditation that has been developed and established within the consensus principles of NELAC and meets the approval requirements of NELAC procedures and policies. (ASQC)

Standard Operating Procedure (SOP): A written document which details the method of an operation, analysis or action whose techniques and procedures are thoroughly prescribed and which is accepted as the method for performing certain routine or repetitive tasks. (QAMS)

Standard Reference Material (SRM): A certified reference material produced by the U.S. National Institute of Standards and Technology and characterized for absolute content, independent of analytical test method.

Supervisor (however named): The individual(s) designated as being responsible for a particular area or category of scientific analysis. This responsibility includes direct day-to-day supervision of technical employees, supply and instrument adequacy and upkeep, quality assurance/quality control duties and ascertaining that technical employees have the required balance of education, training and experience to perform the required analyses.

Surrogate: A substance with properties that mimic the analyte of interest. It is unlikely to be found in environment samples and is added to them for quality control purposes. (Glossary of Quality Assurance Terms, QAMS, 8/ 31/ 92)

Systems Audit (also Technical Systems Audit): A thorough, systematic, qualitative on-site assessment of the facilities, equipment, personnel, training, procedures, record keeping, data validation, data management, and reporting aspects of a total measurement system. (EPA-QAD)

Technical Director (however named): Has overall responsibility for the technical operation of the environmental testing laboratory. (NELAC Section 4.1.1.1)

Test: A technical operation that consists of the determination of one or more characteristics or performance of a given product, material, equipment, organism, physical phenomenon, process or service according to a specified procedure. The result of a test is normally recorded in a document sometimes called a test report or a test certificate. (ISO/IEC Guide 2-12.1, amended)

Test Method: An adoption of a scientific technique for a specific measurement problem, as documented in a laboratory SOP. (NELAC)

Testing Laboratory: Laboratory that performs tests. (ISO/ IEC Guide 2 - 12.4)

Test Sensitivity/Power: The minimum significant difference (MSD) between the control and test concentration that is statistically significant. It is dependent on the number of replicates per concentration, the selected significance level, and the type of statistical analysis (NELAC)

Traceability: The property of a result of a measurement whereby it can be related to appropriate standards, generally international or national standards, through an unbroken chain of comparisons. (VIM - 6.12)

Validation: The process of substantiating specified performance criteria. (EPA- QAD)

Verification: Confirmation by examination and provision of evidence that specified requirements have been met. (NELAC)

NOTE - Verification provides a means for checking that the deviations between values indicated by a measuring instrument and corresponding known values of a measured quantity are consistently smaller than the maximum allowable error defined in a standard, regulation or specification peculiar to the management of the measuring equipment. The result of verification leads to a decision either to restore in service, to perform adjustments, or to repair, or to downgrade, or to declare obsolete. In all cases it is required that a written trace of the verification performed shall be kept on the measuring instrument's individual record.

Work Cell: A well defined group of analysts that together perform the method analysis. The members of the group and their specific function/s within the work cell must be fully documented. (NELAC)

Tune – An injected standard required by the method as a check on instrument performance for mass spectrometry.

4.0 ORGANIZATION AND MANAGEMENT STRUCTURE

4.1 LEGAL DEFINITION OF THE LABORATORY

EMAX Laboratories, Inc., referred to as EMAX, is a full-service environmental analytical laboratory located at 1835 W. 205th St., Torrance, California 90501. The company is a woman-owned, disadvantaged, small-business enterprise and is certified as such with numerous states and local government agencies. It is organized and operates in such a way that its permanent facility meets the requirements of the NELAP Standard. EMAX business license number 5294 is registered with the City of Torrance, State of California.

4.2 ORGANIZATION

The following past and continuing actions by EMAX ensure that its organization shall be able to function as expected by the industry standard.

- Employed managerial staff, referred to as Business Development Manager, Quality Assurance Manager, Technical Operations Manager, Project Managers, and Information Systems Manager, with authority and resources needed to discharge their duties;
- Established processes to ensure that its personnel are free from any commercial, financial and other undue pressures which might adversely affect the quality of their work;
- Established checks and balances to ensure confidence in its independence of judgment and integrity is maintained at all times;
- Specified and documented responsibility, authority, and interrelationship of all personnel who manage, perform or verify work affecting the quality of calibrations and tests. Such documentation includes: a clear description of the lines of responsibility in the laboratory, job descriptions for all positions, and a specified proportionality to assure adequate supervision for all positions;
- Provide supervision by persons familiar with the calibration or test methods and procedures, the objective of the calibration or test and the assessment of the results. The ratio of supervisory to non-supervisory personnel ensures staff adherence to laboratory procedures and accepted techniques.
- Employed a Technical Director who has overall responsibility for the technical operation of the environmental testing laboratory. The Technical Director shall certify that personnel with appropriate educational and/or technical background perform all tests for which the laboratory is accredited. Such certification shall be documented. The Technical Director shall meet the requirements specified in the NELAP Accreditation Process.
- Employed a Quality Assurance Officer, referred to as QA Manager, who has responsibility for the quality systems and their implementation. The QA Manager has direct access to the highest level of management at which decisions are taken on laboratory policy or resources and to the Technical Director.

  The QA Manager (and/or his/her designees) shall

  1) Serve as the focal point for QA/QC and be responsible for the oversight and/or review of quality control data;

2) Function independently from the laboratory operations for which the QA Manager has quality assurance oversight;

3) Evaluate data objectively and perform assessments without outside (e.g., managerial) influence;

4) Have documented training and/or experience in QA/QC procedures and be knowledgeable in the quality system as defined under NELAC;

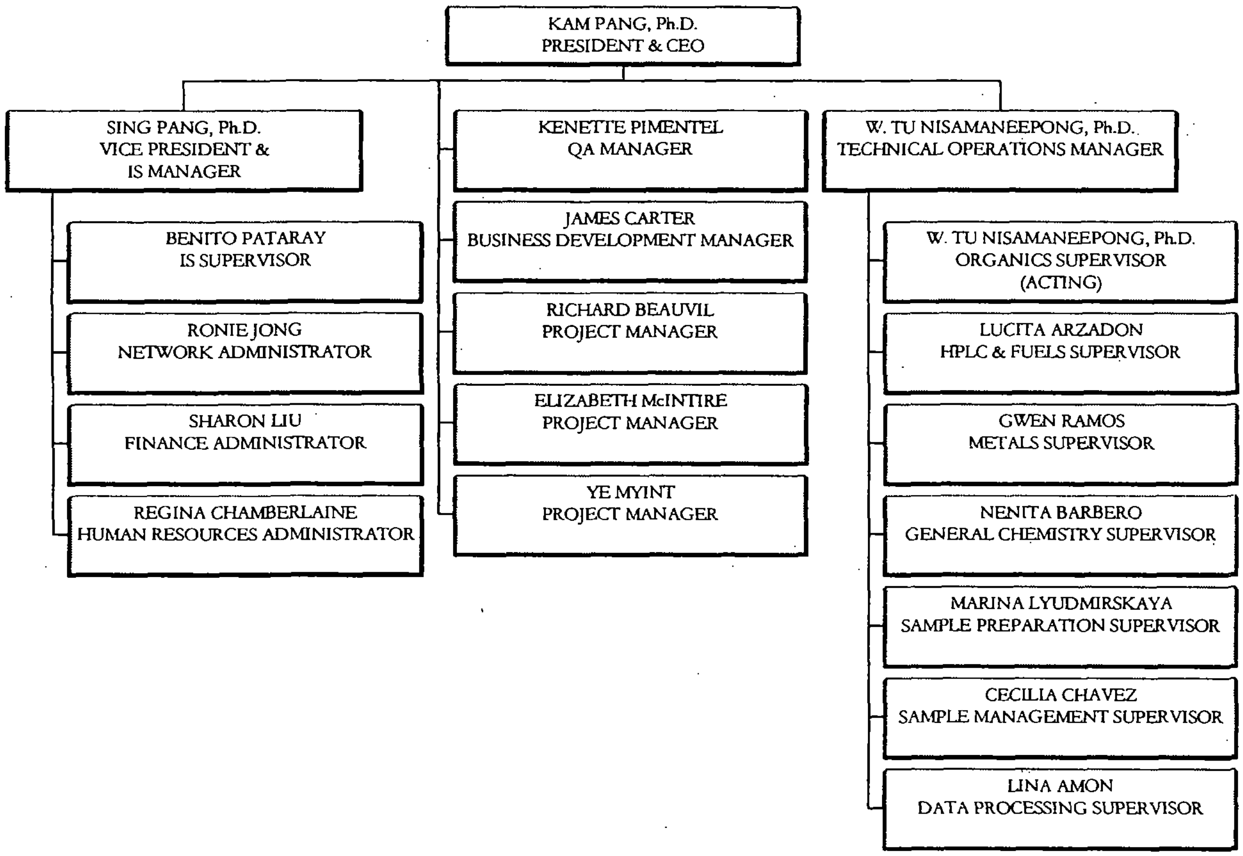
5) Have a general knowledge of the analytical test methods for which data review is performed;

6) Arrange for or conduct annual internal audits on the entire technical operation and notify laboratory management of deficiencies in the quality system as well as monitor corrective action.

- Documented policies and procedures to ensure the protection of clients' confidential information and proprietary rights;
- When appropriate, participated in interlaboratory comparisons and proficiency testing programs as described in Chapter Two of NELAC Quality Systems.

4.3 MANAGEMENT STRUCTURE

EMAX MANAGEMENT STRUCTURE



5.0 QUALITY SYSTEMS POLICIES

5.1 QUALITY POLICY STATEMENT

The management team of EMAX is committed to assure that all data collection and processing by EMAX are precisely performed, accurately presented, scientifically valid and legally defensible. This manual and the quality procedures are established to meet the requirements of the NELAC Standards.

5.2 LABORATORY ORGANIZATION & MANAGEMENT STRUCTURE

The laboratory shall be under the direction of the Technical Director. To ensure adequate supervision, Technical Operations is divided into different departments and shall be under the management of the Technical Operations Manager. Each department shall have a supervisor with adequate technical staff. Laboratory Structure, qualifications and resumes of current employees are detailed in Section 6.

5.2.1 GENERAL REQUIREMENTS FOR LABORATORY STAFF

The laboratory shall have sufficient personnel with the necessary education, training, technical knowledge and experience for their assigned functions.

All personnel shall be responsible for complying with all quality assurance/quality control requirements that pertain to their organizational/technical function. Each technical staff member must have a combination of experience and education to adequately demonstrate a specific knowledge of their particular function and a general knowledge of laboratory operations, test methods, quality assurance/quality control procedures and records management.

5.2.2 LABORATORY MANAGEMENT RESPONSIBILITIES

The laboratory management shall be responsible for:

1. Defining the minimal level of qualification, experience and skills necessary for all positions in the laboratory. In addition to education and/or experience, basic laboratory skills such as proper use of instrumentation, software or quantitative techniques shall be considered. Refer to Section 6 for detailed personnel minimum qualifications.

2. Ensuring that all technical laboratory staff has demonstrated capability in the activities for which they are responsible. The manner in which such demonstration shall be established is documented in Appendix C.

3. Ensuring that the training of each member of the technical staff is kept up-to-date (on-going) by the following:

   - Evidence must be on file that demonstrates that each employee has read, understood, and is using the latest version of the laboratory's in-house quality documentation which relates to his/her job responsibilities.
   - Attendance of each employee at training courses or workshops on specific equipment, analytical techniques or laboratory procedures shall be documented.

- Attendance of each employee at training courses in ethical and legal responsibilities, including the potential punishments and penalties for improper, unethical or illegal actions, shall be documented.
- Evidence must be on file which demonstrates that each employee has read, acknowledged and understood their personal ethical and legal responsibilities including the potential punishments and penalties for improper, unethical or illegal actions.

4. Analyst training shall be considered up to date if an employee training file contains (a) a certification that technical personnel have read, understood and agreed to perform the most recent version of the test method (the approved method or standard operating procedure) and (b) documentation of continued proficiency (by at least one of the following) once per year:
   - Acceptable performance of a blind sample (single blind to the analyst);
   - Another demonstration of capability;
   - Successful analysis of a blind performance sample on a similar test method using the same technology (e.g., GC/MS volatiles by purge and trap for Methods 524.2, 624 or 5035/8260) would only require documentation for one of the test methods;
   - At least four consecutive laboratory control samples with acceptable levels of precision and accuracy;
5. Documenting all analytical and operational activities of the laboratory;
6. Supervising all personnel employed by the laboratory;
7. Ensuring that all sample acceptance criteria (Section 5.11) are verified and that samples are logged into the sample tracking system and properly labeled and stored;
8. Documenting the quality of all data reported by the laboratory; and
9. Developing a proactive program for prevention and detection of improper, unethical or illegal actions.

5.2.3 JOB DESCRIPTIONS OF KEY STAFF

5.2.3.1 President & CEO

- Interface with Operations and Quality Assurance in the formulation and implementation of the Quality Systems.
- Manage, by ensuring clear and consistent communication, and coordinate a team of professionals and their respective departments to solve all encountered problems.
- Drive project management activities to influence quality output with the goal of enhancing customer satisfaction.
- Review the effectiveness of Quality Systems and instigate improvement accordingly.
- Delegate deputies in case of absence of the Technical Operations Manager and/or Quality Assurance Manger.

5.2.3.2 Technical Operations Manager

- Provide intellectual leadership in technical operations, project management and logistics of domain technical knowledge.

- Certify quality technical staff to perform the test methods specified in this manual.
- Plan and adjust work operations to meet various project requirements or quick turn-around-time without sacrificing the quality and quantity of work;
- Coordinate and integrate the work activities and resources of the different departments or organizational segments;
- Analyze organizational and operational problems and develop timely and economical solutions;
- Establish performance goals and assess progress toward their achievement;
- Deal effectively with the department supervisors and assume their tasks in their absence.
- Sign off on all reports to clients and randomly review at least 10% of the overall report production.
- Devise ways to accommodate work operations to new and changing programs or requirements such as method development and staffing

5.2.3.3 Project Managers

- Review project requirements;
- Generate technical summary of project specific requirements (PSR), including test methods, reporting limits, QC procedures and QC limits;
- Review data packages for completeness in accordance to PSR
- Maintain a line of communication and documentation of all transactions with the client.
- Initiate request for variance whenever necessary and disseminate project change orders to respective parties.

5.2.3.4 Laboratory Supervisors

- Assign and review the work of subordinates;
- Train and work effectively with subordinates;
- Accomplish the quantity of work expected within set limits of cost and time employing the quality systems of EMAX;
- Plan own work and carry out assignments effectively;
- Arrange for or conduct maintenance of instrumentation to produce quality data and minimize downtimes;
- Review and resolve reported anomalies when they are encountered;
- Communicate orally and in writing in working out solutions to problems or questions relating to the work and institute program(s) to prevent problem recurrence;
- Ensure initial and continuing demonstration of capability of subordinates;
- Review and revise test methods related to respective work as necessary;
- Understand and advance management goals as these affect day-to-day work operations; and
- Develop improvements or design new test methods through method development process;

5.2.3.5 **Electronic Deliverable Supervisor**

- Develop and maintain programs for generating and validating electronic data deliverables, as well as assuring data integrity and security and providing backup systems, guided by the GALP.
- Assign and review the work of subordinates;
- Train and work effectively with subordinates;
- Accomplish the quality and quantity of work expected within set limits of cost and time;
- Plan own work and carry out assignments effectively;
- Review and revise related SOPs as necessary;
- Review and resolve reported anomalies when they are encountered;
- Communicate orally and in writing in working out solutions to problems or questions relating to the work;
- Understand and advance management goals as these affect day-to-day work operations; and
- Develop improvements or design systems to meet the industry demand.

5.2.3.6 **Data Processing Supervisor**

- Assign and review the work of subordinates based on turn-around-time.
- Train and work effectively with subordinates;
- Accomplish the quality and quantity of work expected within set limits of cost and time;
- Plan own work and carry out assignments effectively;
- Review and resolve reported anomalies when they are encountered.
- Communicate orally and in writing in working out solutions to problems or questions relating to the work;
- Review and revise related SOPs as necessary;
- Understand and advance management goals as these affect day-to-day work operations; and
- Develop improvements or design systems to meet the industry demand.

5.2.3.7 **Analysts**

- Complete initial demonstration of capability before assuming responsibility and ensure continuing demonstration of capability in accordance with the quality systems;
- Plan own work and carry out assignments effectively
- Review and employ appropriate test methods and SOPs related to respective works;
- Report anomalous circumstances to the Supervisor or the Technical Operations Manager; and
- Accomplish the quality and quantity of work expected within set limits of cost and time;

5.2.3.8 **Technicians**

- Complete initial demonstration of capability before assuming responsibility and ensure continuing demonstration of capability in accordance with the quality systems.
- Plan own work and carry out assignments effectively;

- Review and employ appropriate test methods and SOPs related to respective works;
- Report anomalous circumstances to the Supervisor or the Technical Operations Manager;
- Accomplish the quality and quantity of work expected within set limits of cost and time;

5.2.3.9 Data Processors

- Plan own work and carry out assignments effectively;
- Process reports in accordance with EMAX-DM01 and EMAX-IS11.
- Review and employ appropriate SOPs related to respective works;
- Report anomalous circumstances to the Supervisor or the Technical Operations Manager;
- Accomplish the quality and quantity of work expected within set limits of cost and time;

5.2.4 LABORATORY'S APPROVED SIGNATORIES

The approved signatories are as found on the title page of the Quality Systems manual.

5.3 PROCEDURES FOR AUDITS AND DATA REVIEW

Procedures for audits are detailed in EMAX-QA07 and for Data Review in EMAX-DM01.

5.3.1 INTERNAL AUDITS

The QA Manager shall arrange for internal audits at least annually to verify that EMAX operations continue to comply with the requirements of the laboratory's quality system. It is the responsibility of the QA Manager to plan and organize audits not only as required by a predetermined schedule but also as requested by management. Such audits shall be carried out by the QA Manager or qualified personnel who are, wherever resources permit, independent of the activity to be audited. Personnel shall not audit their own activities except when it can be demonstrated that an effective audit will be carried out.

Where the audit findings cast doubt on the correctness or validity of the laboratory's calibrations or test results, the laboratory shall take immediate corrective action and shall immediately notify, in writing, any client whose work may have been affected.

5.3.2 MANAGERIAL REVIEW

The President & CEO shall conduct a review, at least annually, of its the laboratory's quality system regarding its testing and calibration activities. The purpose of this review is to ensure its continuing suitability and effectiveness and to introduce any necessary changes or improvements in the quality system and laboratory operations.

The review shall include the following:

- Technical Operations Annual Report
- Quality Assurance Annual Report
- Business Development Annual Report

Technical Operations Reports shall discuss the Technical Operations accomplishment, improvements, the most recent laboratory organizational structure and goals for the upcoming year.

The Quality Assurance Annual Reports shall include the outcome of recent internal and external audits, assessments by external bodies, the results of interlaboratory comparisons or proficiency tests and other quality assurance activities.

The Business Development Annual Reports shall include the volume of work completed in the recent year and the upcoming/prospective projects.

The laboratory shall maintain records of all managerial review findings and actions.

5.3.3 AUDIT REVIEW

All audit and review findings, as well as any corrective actions that arise from them, shall be documented. The laboratory management shall ensure that the required corrective actions, if any, are discharged within the agreed time frame.

Refer to Appendix B for the latest internal audit conducted.

5.3.4 PERFORMANCE AUDITS

In addition to periodic audits, the laboratory shall ensure the quality of results provided to clients by implementing checks to monitor the quality of the laboratory's analytical activities. The QA Department shall implement the following where applicable to check quality indicators:

- Internal quality control procedures in every analytical work order;
- Participate in proficiency testing;
- Perform trending analysis on Laboratory Control Samples;
- Replicate testing using the same or different test methods;
- Re-testing of retained samples; and
- Correlation of results for different parameters of a sample (for example, total phosphorus should be greater than or equal to orthophosphate).

5.3.5 CORRECTIVE ACTIONS

In addition to providing acceptance criteria and specific protocols for corrective actions in the Method Standard Operating Procedures, the laboratory shall implement general procedures to determine when departures from documented policies, procedures and quality control have occurred. These procedures shall include but are not limited to the following requirements:

- identify the individual(s) responsible for assessing each QC data type;
- identify the individual(s) responsible for initiating and/or recommending corrective actions;
- define how the analyst should treat a data set if the associated QC measurements are unacceptable;
- specify how out-of-control situations, and subsequent corrective actions, are to be documented; and,
- specify procedures for management (including the QA Manager) review of corrective action reports.

To the extent possible, EMAX shall only report sample results when the data meet acceptable quality control measures. If a quality control measure is out of acceptance criteria and there is a need to report the data, EMAX shall qualify all samples associated with the failed quality control measure with the appropriate data qualifier(s) as required by the project.

5.4 ESSENTIAL QUALITY CONTROL PROCEDURES

5.4.1 QUALITY CONTROL PROCEDURES

EMAX quality control procedures (QCP) shall be an integral part of the test manuals and applicable QCP shall be attached to every analytical work order. The QCP shall include but not limited to the following:

- QC parameters, such as, calibrations, blanks, spikes, duplicates, etc.;
- Frequency of implementing the required QC parameter;
- QC parameter acceptance criteria;
- Corrective action in case QC acceptance criteria is not met; and
- Flagging convention for qualifiers.

Refer to Appendix 1 in the test method manuals for Summary of Quality Control Procedures for each test method.

In general all analytical methods developed at EMAX shall follow the above QC parameters, when applicable. The laboratory shall follow EMAX-QA03 – Method Development SOP, for the development of acceptance/rejection criteria where no method or regulatory criteria exists.

5.4.2 NEGATIVE CONTROLS

5.4.2.1 Blanks

A blank is an artificial sample designed to monitor the introduction of contamination into the testing process. For aqueous samples, reagent water is used as a blank matrix. For soil samples, blank soil (where available) is used.

5.4.2.2 Method Blanks (MB)

Method blanks are target analyte free samples that are taken through the entire analytical procedure on the instrument. Whenever available, the matrix of the MB is matched with the field samples analyzed with the batch. The method blanks provide information concerning possible contamination during sample preparation and analysis. One method blank is prepared per analytical batch. The results of this analysis shall be one of the QC measures to be used to assess batch acceptance. The source of contamination in a method blank must be investigated and measures taken to correct, minimize or eliminate the problem if either of the following conditions exist:

- the blank contamination exceeds a concentration greater than 1/10 of the measured concentration of any sample in the associated sample batch, or
- the blank contamination exceeds the concentration present in the samples and is greater than 1/10 of the specified regulatory limit.

Any sample associated with the contaminated blank shall be reprocessed for analysis or the results reported with appropriate data qualifying codes.

5.4.2.3 System Blanks (IB)

System blanks are either reagent water or solvent that has not gone through the sample work-up. The instrument analyzes these blanks under the same conditions as sample analysis. The system blanks provide information about possible contamination in the instrument. An instrument/system blank is analyzed as part of the daily instrument check.

5.4.2.4 Refrigerator Blanks (RB)

Refrigerator blanks (also referred to as storage blanks) are samples prepared in 40-ml vials containing reagent water appropriately prepared for volatile analysis. These blanks are stored in the refrigerators used for volatile samples to monitor possible cross contamination. One RB sample from every volatile storage refrigerator shall be analyzed once a week by volatile analysis. Procedure is detailed in EMAX-QC03 – Refrigerator Control.

5.4.3 POSITIVE CONTROLS

5.4.3.1 Laboratory Control Sample (LCS)

EMAX utilizes LCS, also known as QC check samples (QCS), as a positive control. One LCS is analyzed per batch of 20 or less samples per matrix type per sample extraction or preparation method, except for analytes for which spiking solutions are not available. Spiking solutions are not available for total suspended solids, total dissolved solids, total volatile solids, total solids, pH, color, odor, temperature, dissolved oxygen or turbidity. The results of the LCS samples shall be used to determine batch acceptance. NOTE: The matrix spike may be used in place of this control as long as the acceptance criteria are as stringent.

5.4.3.2 Matrix Spike

Matrix Spike shall be performed at a frequency of one in 20 samples per matrix type per sample extraction or preparation method except for analytes for which spiking solutions are not available. The selected sample(s) shall be rotated among client samples so that various matrix problems may be noted and/or addressed. Poor performance in a matrix spike may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the spike.

For projects that do not designate matrix spike samples, the PM shall include the MS samples as part of project monitoring and shall advise the laboratory when to choose a sample for MS/MSD or MS/Sample Duplicate as samples are received in the laboratory.

5.4.3.3 Surrogates

Surrogate compounds shall be added to all samples, standards, and blanks, for all organic chromatography methods except when the matrix precludes its use or when a surrogate is not available. Poor surrogate recovery may indicate a problem with the sample composition and shall be reported to the client whose sample produced the poor recovery by discussing it in the case narrative of the analytical report.

5.4.3.4 Spiking Components

If the mandated or requested test method does not specify the spiking components, EMAX shall spike with all reportable components. The use of spiking components in the Laboratory Control Sample and Matrix Spike shall be limited in the following circumstances:

- The components interfere with accurate assessment (such as simultaneously spiking chlordane, toxaphene and PCBs in Method 8082).
- The test method has an extremely long list of components or components are incompatible. A representative number (at a minimum 10%) of the listed components may be used to control the test method. The selected components of each spiking mix shall represent all chemistries, elution patterns and masses, permit specified analytes and other client requested components.

EMAX shall ensure that all reported components used in the spike mixture are employed within a two-year time period from component acquisition. For exotic analytes, (e.g. aroclors other than 1016 and

1260, toxaphene, chlordane, MCPA MCPP, etc.) they shall be used for LCS spike during MDL verification.

5.4.3.5 Real Time Evaluation

All analytical methods are assessed for data quality on a real time basis using the project specified control limits - or laboratory internal control limits in the absence of project specific control limits. Analytical work orders are distributed to the bench with applicable quality control limits.

5.4.4 ANALYTICAL VARIABILITY/REPRODUCIBILITY

5.4.4.1 Matrix Spike Duplicates (MSDs) or Laboratory Duplicates

Matrix Spike Duplicates (MSDs) or Laboratory Duplicates shall be analyzed at the rate of 1 in 20 samples per matrix type per sample extraction or preparation method. A majority of EMAX's projects selects the sample to be analyzed for MSDs and/or Laboratory Duplicates. In the event that the project does not specify these samples, the laboratory operations shall select the sample(s). The laboratory shall rotate the selection among client samples so that various matrix problems may be noted and/or addressed. Poor performance in the duplicates may indicate a problem with the sample composition and shall be reported to the client whose sample was used for the duplicate.

5.4.5 METHOD EVALUATION

In order to ensure the accuracy of the reported result, the following procedures shall be in place prior to analysis of any sample.

- Demonstration of Analytical Capability shall be performed initially (prior to the analysis of any samples) and with a significant change in instrument type, personnel, matrix or test method. (Refer to Appendix 2 of the analytical tests manuals).
- Calibration protocols specified in the test manuals are acceptable.
- Proficiency Test Samples Results are evaluated and demonstrate the ability of the laboratory to produce accurate data.

5.4.6 DETECTION LIMITS

EMAX shall establish detection limits for each analyte of interest, as specified in the test manuals. If the protocol for determining detection limits is not specified, the selection of the procedure must reflect instrument limitations and the intended application of the test method. Detection limits shall be determined each time there is a significant change in the test method or instrument type. Samples for detection limit study shall be subjected to all the same sample processing steps of the analytical method as a regular sample.

5.4.6.1 Method Detection Limit (MDL)

Method Detection Limit (MDL) is the minimum concentration of a substance that can be measured with 99% confidence that the analyte is greater than zero. Seven MDL samples are prepared and analyzed according to the analytical method. The results are statistically evaluated. The SOP for MDL (EMAX-QA04) describes the details of generation and validation of MDL.

MDL is not required for any analyte for which spiking solutions or quality control samples are not available(e.g. temperature, pH, moisture, ignitability, etc.).

5.4.6.2 Reporting Limit (RL)

Reporting Limit (RL) is the minimum concentration of a substance that can be measured by an instrument quantitatively. For analytical methods having multi-calibration points, the RL is determined by the lowest concentration of the calibration levels based upon the final volume of the extract or sample. For analytical methods that do not specify detection limit determination, the RL is based on the instrument detection limit.

5.4.7 DATA REDUCTION

The procedures for data reduction shall be described in the test method manuals. All electronically acquired data are processed electronically using EMAX report generation software.

5.4.8 QUALITY OF STANDARDS AND REAGENTS

All analytical standards are purchased as certified (when available) by the vendor and verifiable to a standard reference material (i.e., NIST) or any other agencies known to have similar function and credentials). Refer to EMAX-QC02 for more detail information.

Reagents are purchased as reagent grade or better. Reagents undergo quality control testing prior to use. EMAX-QC01 details the process of quality control for chemicals. Chemicals/reagents that have passed the QC acceptance criteria shall bear a "QC PASSED" sticker, indicating the QC reference number traceable to the QC documentation. Reagents that do not pass the QC acceptance criteria shall be returned to the vendor.

Reagent Water produced in the laboratory shall be monitored daily as described in EMAX-QC01. A logbook shall be used to record the daily monitoring. Commercially purchased reagent water shall undergo the same test as any chemical/reagent and shall conform to the method specified requirements.

5.4.9 SELECTIVITY

EMAX shall describe Qualitative Determination for each target analyte based on the requirement of the analytical method and instrument detector. Analyte identification is detailed in every test method manual.

Gas and liquid chromatography shall use peak absolute retention time as qualitative identification requiring tentatively identified analyte confirmation by another column or another detector. Both tentative and confirmation results shall be maintained and properly documented.

Retention time window study is based on three non-consecutive measurements of retention time for each analyte within a 72-hour period. The standard deviation (SD) and the mean retention time is calculated. The magnitude of retention time window is establish by $\pm$ 3 x SD.

New retention time study is established when new column is installed or when there is a major change in the instrument parameter setup.

When analyzing an analyte using chromatography equipped with mass spectrometry, confirmation shall be evaluated by comparing the sample mass spectrum with characteristic ions in the reference mass spectrum. Mass spectral tuning shall be performed prior to daily calibration. Acceptance criteria are specified in the related test method manuals.

5.4.10 CONSTANT AND CONSISTENT TEST CONDITIONS

EMAX shall assess and evaluate all quality control measures on an on-going basis. Quality control acceptance criteria shall determine the usability of the data. Refer to Appendix 1 in test method manuals for the Summary of Quality Control Procedures for the essential testing measures. These Quality Control Procedures are also incorporated in each of the test method manuals.

EMAX shall have procedures for acceptance/rejection criteria where no method or regulatory criteria exist. They are established guided by good science and good laboratory practices. Essential Quality Control procedures are listed in 10.6.2. Analytical procedures shall undergo method development guided by EMAX-QA03, where method proficiency and quality control procedures shall be similarly established, e.g., kerosene shall have similar QC procedures to EMAX-8015D or volatile compound(s) not included in the 8260B list shall follow the QC procedures set forth in EMAX-8260B.

The quality control protocols specified by the laboratory's method manual shall be attached to every work order distributed in the laboratory in the absence of project specific requirement.

Analytical instruments undergo routine daily maintenance and calibration check prior to sample analysis. Instrument blanks are analyzed to rule-out and document probable environment and instrument contamination.

5.4.10.1 GC/MS Performance Check

Mass spectrometer performance is monitored every 12 hours of operation period by measuring the mass/ion distribution of BFB (volatiles) or DFTPP (semivolatiles). The mass/ion distribution of these compounds has to fulfill the method project specific requirements before analysis can start. Furthermore, mass assignments are checked periodically by using perfluorobutylamine to ensure that mass number is properly assigned.

5.4.10.2 Pesticide Performance Evaluation

Pesticide analysis is subjected to the following additional QC to ensure the quality of data. A mixture of DDT and Endrin is analyzed at the beginning of analysis and at a 12-hour interval. Individual breakdown and the combined breakdown of Endrin and DDT should be less than predetermined criteria for the system to be acceptable.

5.4.10.3 Temperature Controlled Analyses

Analyses dependent on temperature controlled environment (e.g., leaching procedures, GPC, etc.) are performed in work cells where temperature are controlled by a thermostat and temperature is recorded in the analytical log.

5.4.10.4 Glassware Cleaning

All reusable labware is decontaminated prior to reuse. A copy of the SOP for glassware cleaning is posted in the glassware cleaning area.

5.5 MECHANISHM FOR REVIEWING NEW WORK

The review of new work at EMAX is integrated into project management. It includes the review of the Quality Assurance Project Plan (QAPP), the Statement of Work (SOW) and the Sampling Plan and other related documents when available. The mechanism is fully described in EMAX QA01. Refer to Section 10.

5.6 CALIBRATION AND VERIFICATION TEST PROCEDURES

Calibration and verification test procedures shall be included in every test method manual. Applicable calibration and verification shall be attached to every analytical work order.

5.7 PROCEDURES FOR HANDLING SUBMITTED SAMPLES

Procedures for handling submitted samples shall include sample tracking, sample acceptance criteria, sample receiving, sample aliquot, sample storage, and sample disposal. Refer to Section 11.

5.8 REFERENCE TO MAJOR EQUIPMENT & MEASUREMENT STANDARDS

Profile for Major equipment items are found in Appendix E. Procedures of calibration shall be included in the individual test method manuals.

Reference measurement standards, as well as facilities and services used by the laboratory in conducting tests, are described in the specific SOPs. These procedures are listed in Section 8.

5.9 REFERENCE TO VERIFICATION PRACTICES

Verification practices shall include inter-laboratory comparisons through laboratory control samples, proficiency testing programs and internal quality control schemes (e.g., control charts, QA data review).

5.10 PROCEDURES FOR FEEDBACK AND CORRECTIVE ACTION

EMAX personnel shall not intentionally deviate from testing procedures or from documented policies and procedures. However, whenever testing discrepancies are detected or departures from documented policies and procedures occur due to unavoidable circumstances or allowable exceptions, procedures for feedback and corrective action are detailed in EMAX-QA08.

5.11 POLICY ON DEPARTURES FROM POLICIES & PROCEDURES

EMAX laboratory management must document in writing any permited departures from documented policies and procedures or from standard specifications. Such exceptions shall be treated on a case-by-case basis. In considering any exception, the impact on the quality of data is the first and foremost management consideration.

Departures and deviations from SOP that are due to project specific requirements (PRS) are handled by the project management system. Other departures and deviations are classified as minor or major changes. When a departure and/or deviation from SOP will have no impact on data quality, the change is deemed to be a minor change requiring approval of either the immediate supervisor or the Technical Operations Manager. Any departure and/or deviation from SOP that may affect the quality of data is deemed a major change and requires the approval of both the Technical Director and the QA Manager. When granting such approval, the Laboratory Director and the QA Manager shall consider whether the justifying circumstances are of such significance that an addendum to the SOP, a revision of the SOP or a new SOP is needed.

5.12 DEALING WITH COMPLAINTS

EMAX shall treat customer satisfaction with high priority. All customer complaints shall be entertained and assessed appropriately. A Project Manager (PM) shall be designated as primary point of contact at the inception of the project and shall serve as an interface between the customer and EMAX. The PM shall be responsible in resolving issues from the time sampling supplies are ordered to the time the data deliverables are delivered. The PM is also responsible for responding to future questions that may arise from submitted data, hard copy and/or electronic. EMAX-QA08 details the guidelines for taking care of customer complains.

5.13 CONFIDENTIALITY AND PROPRIETARY RIGHTS

EMAX will not intentionally disclose to any person (other than the representative(s) designated by the client) services rendered or information received and/or generated by EMAX. Likewise, information known to be potentially endangering the national security or an entity's propriety rights will not be released.

All employees, upon joining EMAX are informed of the importance of the policy on protecting confidentiality and propriety rights. All data received and generated at EMAX shall remain confidential within EMAX Laboratories, Inc. Reports and other pertinent information are only disclosed by authorized personnel to the clients concerned. No one is permitted to remove or make copies of any EMAX records, reports or documents without prior management approval. Disclosure of confidential information could lead to dismissal.

5.14 ESTABLISHING PERSONNEL CAPABILITY TO PERFORM THEIR DUTIES

EMAX-QA05, SOP for training, shall describe the processes/procedures for establishing personnel capability to perform their duties. They shall be provided the necessary training to carry out their duties and shall have adequate experience prior to working on their own.

5.15 PERSONNEL ETHICAL & LEGAL RESPONSIBILITIES

Processes/procedures for educating and training personnel in their ethical and legal responsibilities, including the potential punishments and penalties for improper, unethical or illegal actions, are also included in EMAX-QA05. All laboratory personnel shall review and renew the acknowledgement of this policy at least once a year.

Demonstration of capabilities for technical staff can be found in Appendix C.

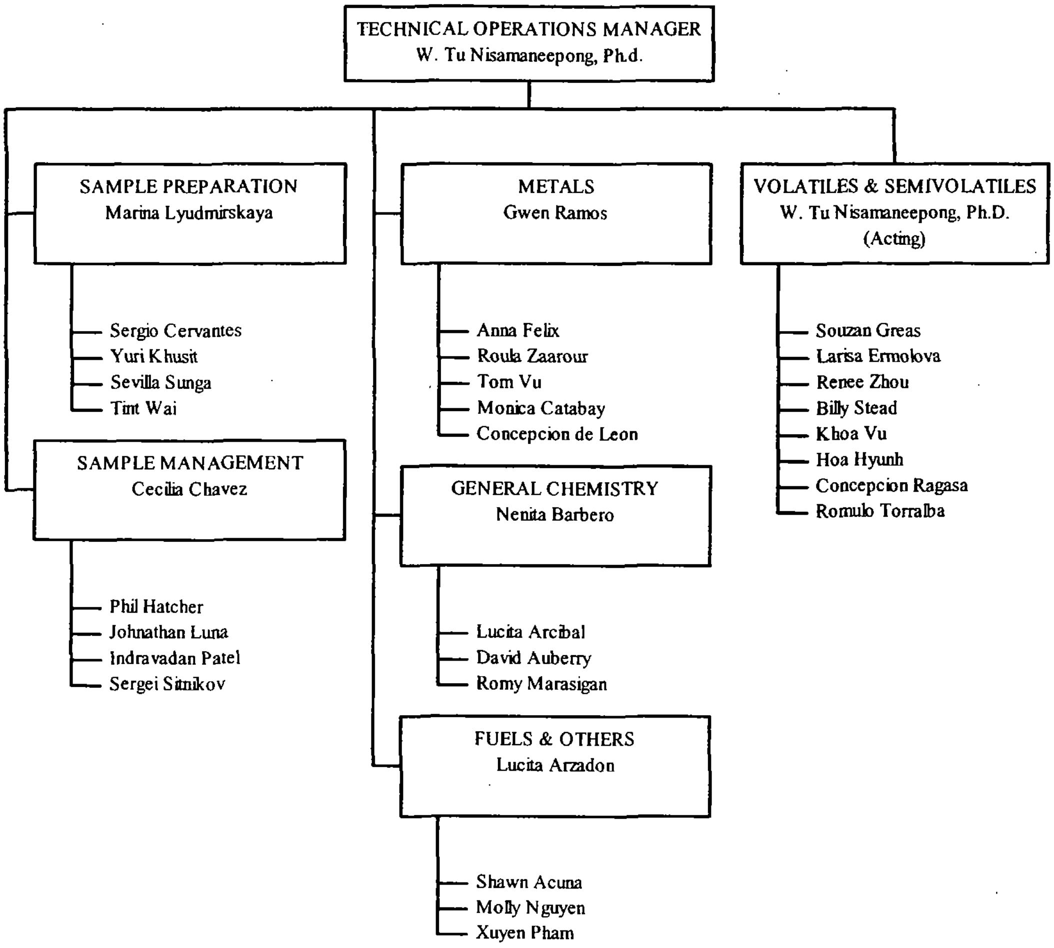
5.16 REFERENCE PROCEDURES FOR REPORTING ANALYTICAL RESULTS

Specific analytical test manuals shall include procedures for reporting analytical results. EMAX-DM01 describes the over all data generation, reduction and review process in general. EMAX standard report format is demonstrated in Section 11.

6.0 PERSONNEL

6.1 LABORATORY STRUCTURE

EMAX LABORATORIES, INC.



6.2 MINIMUM QUALIFICATIONS

6.2.1 TECHNICAL DIRECTOR

- Bachelor's degree in chemistry or any science/engineering discipline.
- Five years of laboratory experience directly related to environmental testing, including at least three years of supervisory experience.

6.2.2 TECHNICAL OPERATIONS MANAGER

- Bachelor's degree in chemistry or any science/engineering discipline.
- Five years of laboratory experience in analytical field, including at least three years of supervisory experience.

6.2.3 QA MANAGER

- Bachelor's degree in chemistry or any science/engineering discipline.
- Five years of laboratory experience, including at least one year of applied experience dealing with QA principles and practices in an analytical laboratory.

6.2.4 PROJECT MANAGER

- Bachelor's degree in chemistry or any science/engineering discipline.
- Three years of analytical laboratory experience including sample analysis, data validation, and QA activities.

6.2.5 DEPARTMENT SUPERVISORS

- Bachelor's degree in chemistry or any science/engineering discipline.
- Three years of analytical laboratory experience, including at least one year of supervisory experience.

6.2.6 ANALYSTS

- Bachelor's degree in chemistry or any science/engineering discipline or in lieu of minimum education requirement, two additional years experience in operating and maintenance in the related field of service.
- Two years experience in related field of service, such as GC/MS, GC, ICP, etc.

6.2.7 TECHNICIANS

- High school diploma and a college level course in general chemistry.
- One-year experience of laboratory work.

6.2.8 LABORATORY INFORMATION MANAGER

- Bachelor's degree with advanced training in programming, information management, database management systems, or systems requirements analysis.
- Three years experience in data or systems management or programming, including one year of experience in laboratory information management system operations.

6.2.9 DATA PROCESSING SUPERVISOR

- Bachelor's degree with course work in management and advanced training in computer software applications.
- Three years experience in data processingWhen granting such approval, the Laboratory Director and the QA Manager shall consider whether the justifying circumstances are of such significance that an addendum to the SOP, a revision of the SOP or a new SOP is needed, including one year of supervisory experience.

6.2.10 ELECTRONIC DATA DELIVERABLES SUPERVISOR

- Bachelor's degree with advanced training in programming, information management, information systems, database management systems or systems requirements analysis.
- Two years experience in systems or applications programming, including one-year experience of data management and EDD generation.

6.2.11 SAMPLE MANAGEMENT SUPERVISOR

- Bachelor's degree in chemistry or any science/engineering discipline.
- Two years of laboratory experience in sample management and at least one year of supervisory experience.

6.2.12 HEALTH AND SAFETY OFFICER

- Bachelor's degree in chemistry or any science/engineering discipline, with 40-hour training on Hazardous Waste Management.
- One-year experience in administering health and safety regulations.

6.3 RECORDS

The QA Department shall maintain a training record for each of the technical staff. Refer to Appendix C for relevant qualifications, training, skills and experience for each staff member.

7.0 PHYSICAL FACILITIES - ACCOMMODATION & ENVIRONMENT

7.1 ENVIRONMENT

EMAX physical facilities were designed in consideration of following parameters:

- Laboratory accommodation, test areas, energy sources, lighting, heating and ventilation shall have adequate mechanical controls to facilitate proper performance of tests.
- The environment where testing and other related functions are undertaken shall not invalidate the results or adversely affect the required accuracy of measurement.
- The facility shall be as safe and free from any form of health hazard as possible.

The laboratory shall effectively monitor, control and record environmental conditions, as appropriate. Monitoring shall be conducted within the respective work areas *e.g. air flowrate of fume hoods, room temperature of temperature controlled tests, etc.) and recorded promptly.

7.2 WORK AREAS

7.2.1 LABORATORIES

7.2.1.1 Volatiles Lab

The Volatiles Lab is in an area of about 3,200 square feet. This laboratory consists of the main Volatiles Lab, DOE Volatiles Lab, the Supervisor's room, and the volatiles sample storage room. This laboratory is isolated from the rest of EMAX's operations and has its own mechanical controls. One Supervisor, three Analysts and one Technician operate this area.

The main Volatiles Lab has a total of 104 Lft. of workbench with two sinks, both equipped with a reagent water filtration system. It has five (5) GC/MS instruments, two with 32-Port Purge and Trap autosamplers and three GC/MS instruments with closed-system autosamplers.

The sample control room is furnished with four sample storage refrigerators, one analytical standard freezer, a total of 18 Lft of workbench, a fume hood and one analytical balance.

The DOE Volatiles lab has its own mechanical controls independent from the main Volatiles Lab. This lab has a total of 18 Lft. of workbench with one sink equipped with reagent water filtration system. This lab houses its own sample storage refrigerator.

7.2.1.2 Main Lab

The Main Lab is a separate area of about 6,000 square feet and includes three Supervisors's offices, the Project Managers' offices and a Standards Preparation room. This Lab has a total of 240 Lft. of workbench with a possibility for an 80 LFt expansion. This laboratory consists of the Semivolatile Lab, Fuels & HPLC Lab, and General Chemistry Lab.

The Semivolatiles GC/MS Lab has three (3) GC/MS instruments, three (3) GC instruments with dual ECD detector, and one (1) GC with NPD detector. One Supervisor and three analysts operate this work area.

The Fuels and HPLC Lab has two (2) GC instruments with FID detectors, one (1) GC instrument with 32-Port Purge and trap, one (1) closed-system auto sampler, and two (2) HPLC instruments equipped with a Fluorescence detector and an UV detector. One Supervisor and three analysts operate this work area.

The General Chemistry Lab has two (2) IC instruments, two (2) TOC instruments, one (1) Spectrometer, one (1) pH meter, one (1) turbidimeter, one (1) BOD meter, one (1) conductivity meter, one (1) Flash Point Tester and other supporting instruments for general chemistry testing. One Supervisor and three Analysts operate this work area.

The Standards Preparation room has three (3) fume hoods and three (3) standards storage refrigerators.

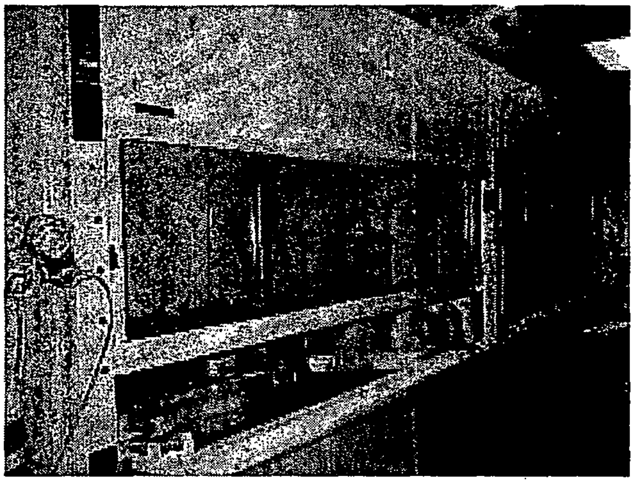
7.2.1.3 Metals Lab

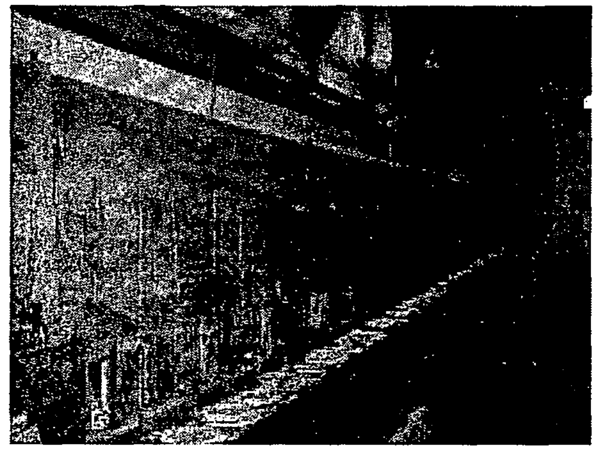
The Metals Laboratory is a separate area about 1,100 square feet. This Lab is consists of a Digestion Lab, the Metals Analysis Lab and the Supervisor's Office.

The Digestion Lab has two acid resistant fume hoods with four hot plates and one fume hood for Standards preparation. The Metals Analysis Lab has two ICPs, one Mercury Analyzer and two GFAA instruments. One supervisor, three Analysts and two Technicians operate this work area.

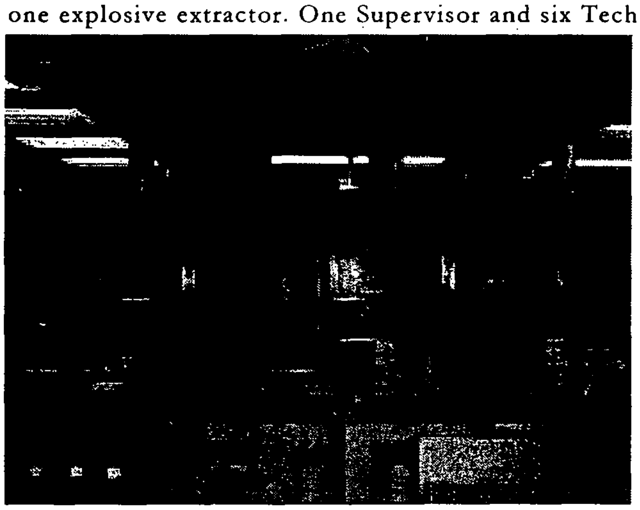
7.2.1.4 Extraction Lab

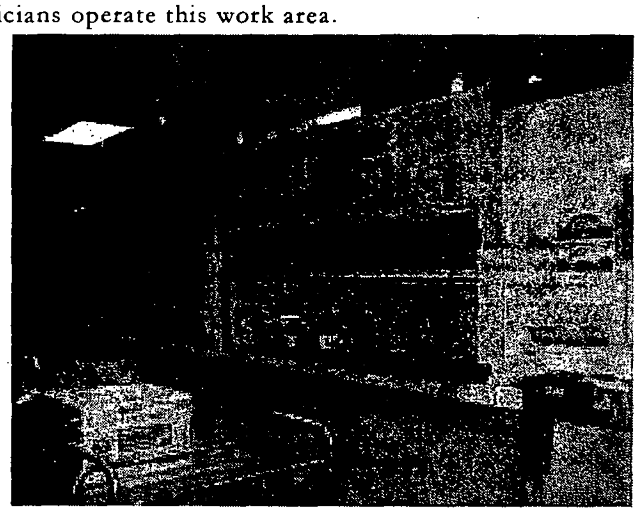
The Extraction Lab is ocupies an area of about 2,500 square feet. This Lab is consists of the main Extraction Lab, the TCLP Lab and the Supervisor's office.





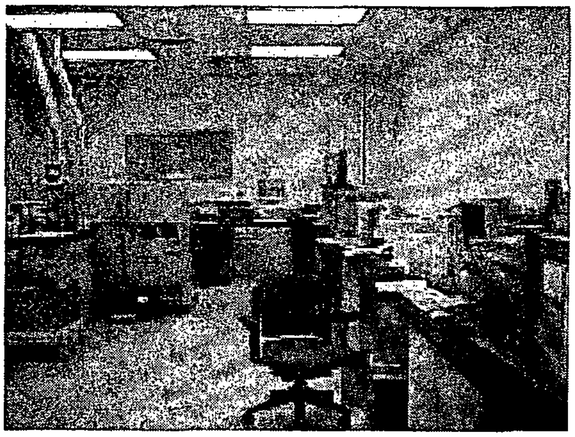
The main Extraction Lab has twelve (12) fume hoods, four (4) sonicators, six (6) concentrators, fifty (50) units of continuous liquid-liquid extractors, fifty (50) units of soxhlet extractors, and one reagent water system. The TCLP Lab has two (2) twelve-position TCLP extractors, three (3) GPC instruments, and one explosive extractor. One Supervisor and six Technicians operate this work area.





7.2.1.5 DOE Lab

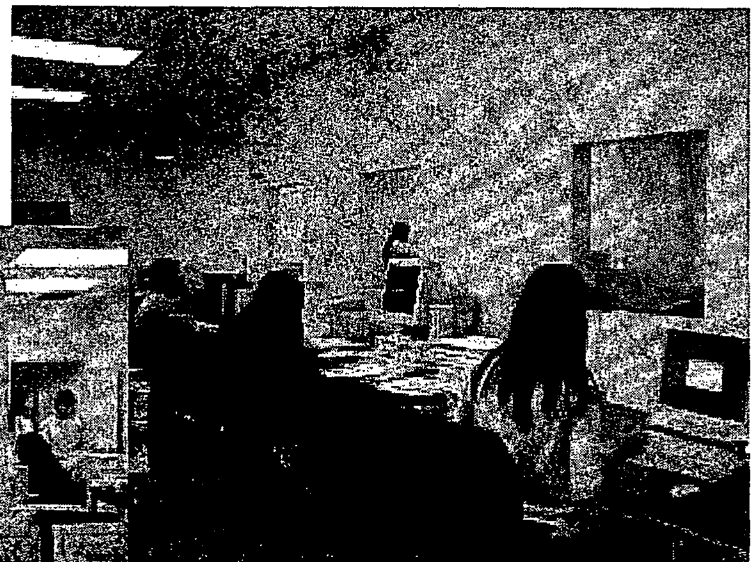
The DOE Lab is a separate area about 1,200 square feet. This lab has its own mechanical controls independent from the rest of the laboratories. This room is designed to have negative pressure so that no air coming from this room migrates to the other labs. This lab has its own extraction lab, semivolatile lab and metals lab. It has a total of 42 Lft of workbench, three acid resistant hoods, one ASE extractor, eighteen (18) continuous liquid-liquid extractors, one concentrator, one sonicator, one GC/MS, one GC with dual ECD detectors, one GC with FID detector, one ICP and one Mercury Analyzer.



7.2.2 SUPPORT FACILITIES

7.2.2.1 Data Processing Lab

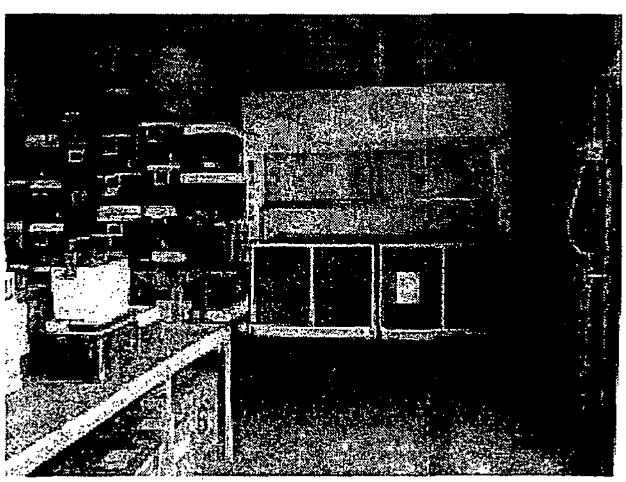
The Data Processing Lab occupies a space about 850 square feetand includes two Supervisors' Offices. This lab has seven computers dedicated to data processing, one printer and two copiers.



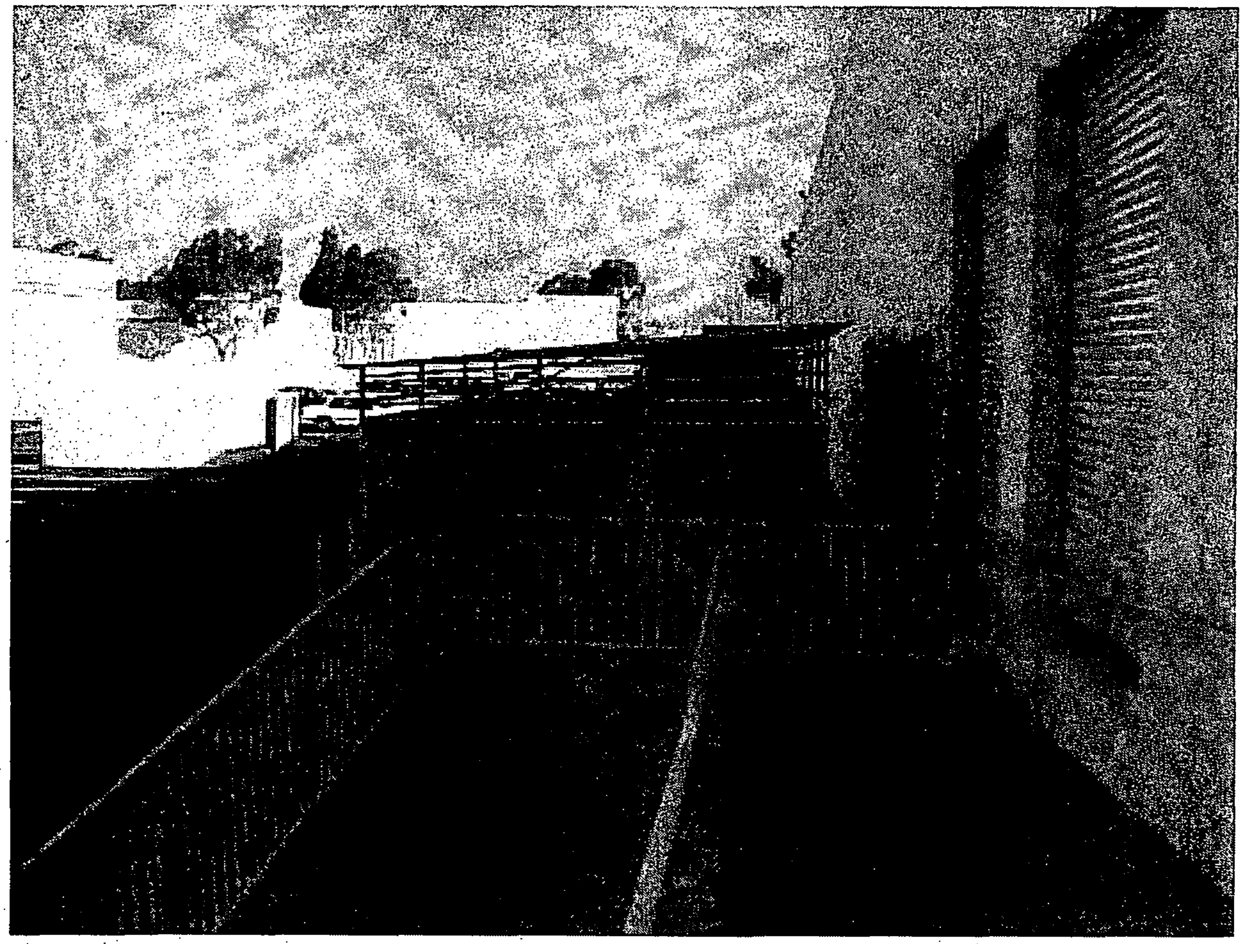
Two Supervisors and seven data processors operate this work area.

7.2.2.2 Sample Receipt, Sample Storage and Waste Storage Area

The Sample Receipt Area is about 500 square feet. It has a fume hood and cooler storage shelves.



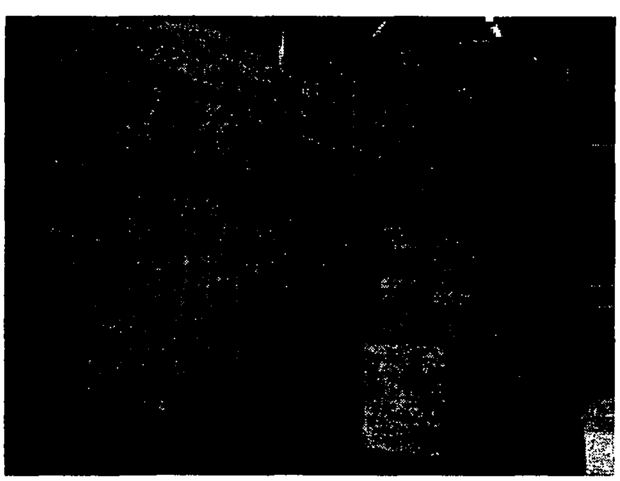
The Sample Storage Area is about 1,000 square feet with one bottle preparation room and one office. It has eight sample storage refrigerators and 12Lft. of workbench.



The Waste Storage Area is an enclosed 200 square feet shed constructed outside the building.

One Supervisor, one Sample Custodian and two technicians operate the Sample Management Department.

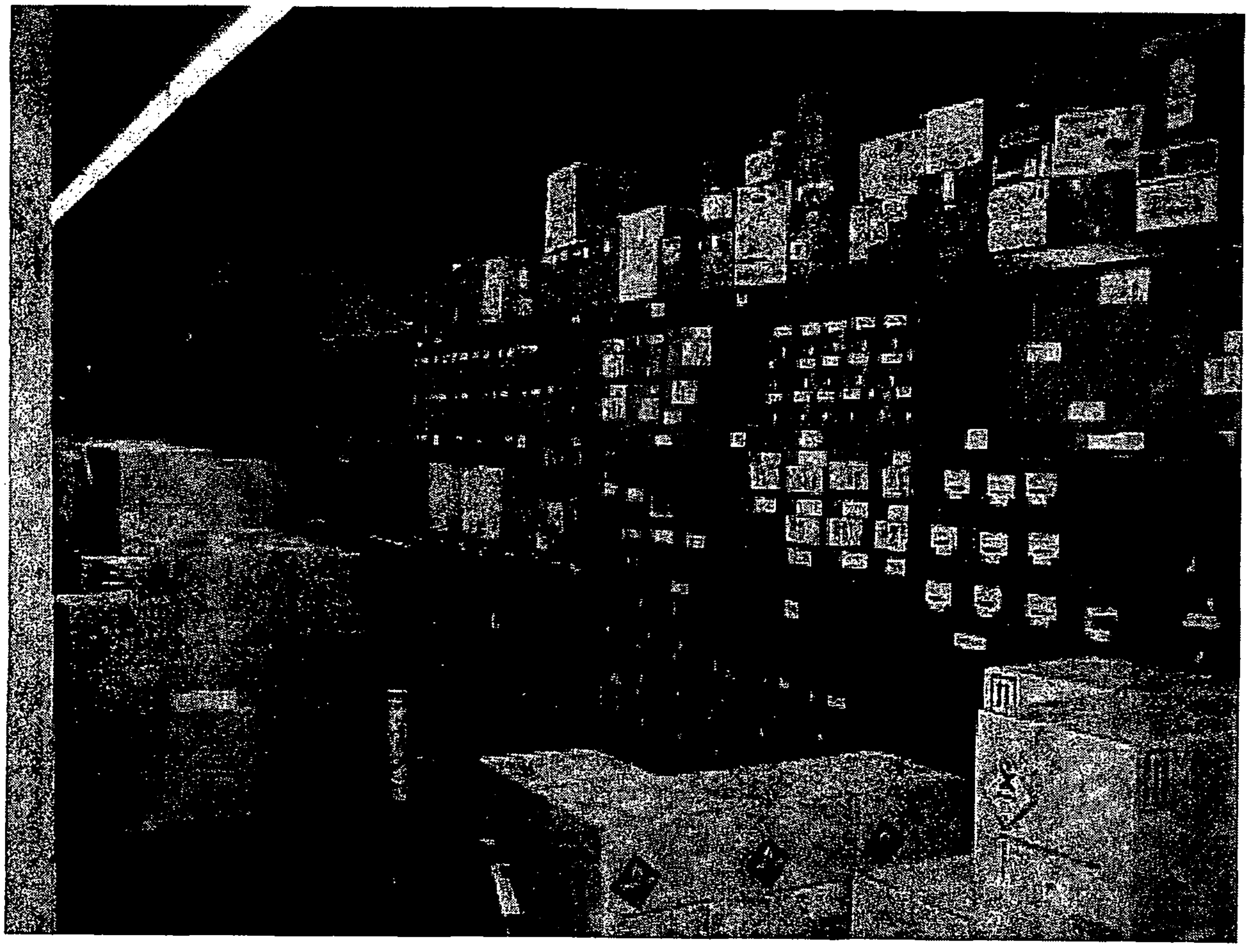
7.2.2.3 Data Storage Room



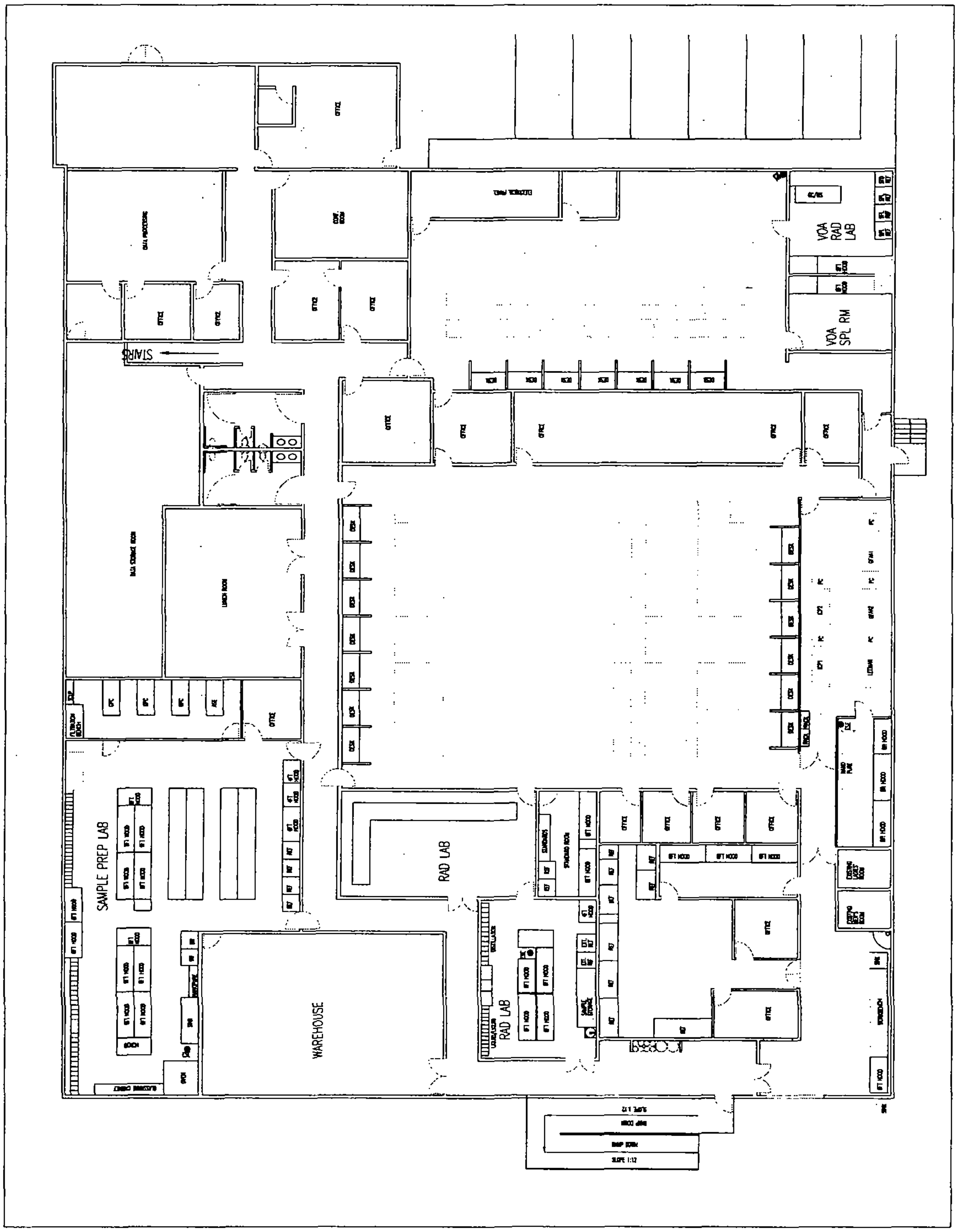
The data storage room is about 1,200 square feet. This room houses archived data packages, laboratory logbooks, and other documents related to the activities of EMAX.

7.2.2.4 Warehouse

The warehouse is about 1,200 square feet. The warehouse stores the laboratory supplies, solvents and reagents in appropriate cabinets.



7.2.2.5 EMAX Floor Plan



8.0 EQUIPMENT AND REFERENCE MATERIALS

EMAX shall have all equipment and instrumentation for the analysis of test methods listed in this manual. Instrument profiles can be found in Appendix E.

All equipment shall be properly maintained, inspected and cleaned. Maintenance procedures shall be documented in the test method manuals. An instrument maintenance log shall be maintained for each analytical instrument.

Any item of equipment identified as out-of-control shall bear a tag "NOT IN SERVICE" until it is back to control. The instrument maintenance log shall document the out-of-control scenario as well as what remedial measures have been done to restore it back to control.

All analytical equipment and analytical support equipment, on a daily basis when in use, shall have a record to manifest that it is properly functioning. Where the instrument is commonly used by several operations (e.g. analytical balances), it shall be tagged to indicate the latest calibration check done. The next user shall make sure that the instrument- has been validated before that user uses the instrument. Reference materials used to verify the instrument calibration shall be recorded in the respective logbooks.

An instrument maintenance logbook shall be maintained for each major item of equipment. The logbook shall include documentation on all maintenance activities (routine and non-routine) and reference material verifications. Specifically, the logbook shall include, but not limited to the following, information:

- the name of the item of equipment
- the manufacturer's name, type identification, and serial number or other unique identification
- date received and date placed in service (if available)
- current location, where appropriate
- if available, condition when received (e.g. new, used, reconditioned)
- copy of the manufacturer's instructions, where available
- dates and results of calibrations and/or verifications and date of the next calibration and/or verification
- details of maintenance carried out to date and planned for the future; and,
- history of any damage, malfunction, modification or repair.

9.0 MEASUREMENT TRACEABILITY & CALIBRATION

9.1 REFERENCE STANDARDS & CALIBRATION

All measuring device and testing equipment having an effect on the accuracy and variability of tests shall be calibrated and/or verified before being put to use. Calibration and/or verification shall thereafter be conducted on a continuing basis.

9.1.1 REFERENCE STANDARDS

Reference standards (e.g., calibration weights and thermometers) are purchased as NIST certified (or equivalent) and are sent for calibration to an NIST certified agency at least once a year or prior to use. Calibration certificates are archived at the QA Department.

9.1.2 CALIBRATION OF SUPPORT EQUIPMENT

Calibration logs shall be used to record calibration checks of analytical support equipment (e.g., balances, thermometers, micropipettes, etc.). The following SOPs detail the procedures for analytical support equipment calibration.

- EMAX-QC03 – Refrigerator Control
- EMAX-QC04 – Balance Calibration
- EMAX-QC05 – Thermometer Calibration
- EMAX-QC06 – Micropipette Calibration

9.1.3 CALIBRATION OF ANALYTICAL INSTRUMENTS

Calibrations for instrumentation, as required by test methods, are performed prior to analysis. These calibrations are performed and verified at the frequency required by the test method. Refer to Appendix 1 in test method manuals.

9.2 MEASURES TO ASSURE THE ACCURACY OF THE TEST METHOD

9.2.1 CALIBRATIONS

All analytical instruments shall be calibrated in accordance with requirements, which are specific to the instrumentation and procedures employed.

9.2.1.1 Initial Calibrations

EMAX shall perform initial calibration to establish the calibration range of the instrument and determine the response over that range. Initial calibration is validated by Initial Calibration Verification (ICV) where the analytical standard used is purchased from a secondary source to counter check the concentrations of the initial calibration standards.

9.2.1.2 Continuing Calibration

Continuing calibration shall be conducted to measure the instrument stability over a period of time by comparing the response to the initial calibration. The details of continuing calibration procedure, calculations, acceptance criteria/corrective actions are included in every analytical test manual. Continuing calibration shall be analyzed as required by the applicable method.

When no method-specific guidance exist, analytical processes using external standard shall bracket the analytical batch with continuing calibration. For analytical processes using internal standard, perform continuing calibration per analytical batch.

The concentration of continuing calibration verification shall be varied within the calibration range and shall be conducted quarterly. Standards below the mid-point and above the mid-point of the calibration range are analyzed during MDL verifications. The results are evaluated using the same criteria as the continuing calibration.

9.2.1.3 Certified Reference Materials

All analytical standards, surrogates, spikes and laboratory control samples shall be purchased as certified reference materials. They shall be traceable to NIST or equivalent.

9.2.2 PROFICIENCY TEST SAMPLES

Proficiency test samples shall be purchased from NVLAP certified vendors and analyzed at a frequency specified by NELAP.

9.2.3 MEASURES TO EVALUATE TEST METHOD CAPABILITY

Method development shall be established using EMAX-QA03. At a minimum the following shall be established to demonstrate analytical capability and method proficiency.

- Method manual shall be established as required by NELAP Standard
- Initial calibration shall be performed to establish the quantitation and identification of target analytes;
- MDL study shall be performed to established the method detection limit;
- Reporting limit shall be established as a result of initial calibration and method detection limit; and
- Four LCS or a proficiency test sample shall be analyzed and recoveries should be within test method requirement or within industry historical acceptance criteria.

9.2.4 SELECTION OF APPROPRIATE FORMULAE FOR DATA REDUCTION

Selection of appropriate formulae to reduce raw data to final results is established by each test method. All necessary formulae for data reduction shall be specified in a sub-section of the test method manual entitled "Calculation".

9.2.5 SELECTION AND USE OF REAGENTS AND STANDARDS

Selection of reagents and standards shall conform to the following SOPs: Purchasing (EMAX-QA09), QC for Chemicals (EMAX-QC01) and Preparation of Analytical Standards (EMAX-QC04)

EMAX-QA09 shall include, but not be limited to, the procedures for the purchase, receipt and storage of consumable materials used for the technical operations of the laboratory. Reagents are purchased as reagent grade or better. All analytical standards are purchased as certified (when available) by the vendor and verifiable to a standard reference material (i.e., NIST or any other agencies known to have similar function and credentials). Refer to EMAX-QC02 for more detailed information.

EMAX-QC01 shall describe the Quality Control for Chemicals used in the technical operations of the laboratory. Reagents undergo quality control testing prior to use. EMAX-QC01 details the process of quality control for chemicals.

EMAX-QC04 shall describe the handling of Analytical Standards. It describes how records are retained for all standards including the manufacturer/vendor, the manufacturer's Certificate of Analysis or purity (if supplied), the date of receipt, recommended storage conditions, and an expiration date after which the material shall not be used unless it is verified by the laboratory. It also describes how the original containers (such as provided by the manufacturer or vendor) shall be labeled with an expiration date.

Logbooks shall be used to record reagent and standard preparations. These records shall indicate traceability to purchased stocks or neat compounds, reference to the method of preparation, date of preparation, expiration date and preparer's initials.

All containers of prepared reagents and standards shall bear a unique identifier and expiration date and be linked to the documentation requirements described above.

9.2.6 SELECTIVITY OF THE TEST FOR ITS INTENDED PURPOSE

Selectivity of the test for its intended purpose is normally specified in the Project QAPP (i.e., CLP, NPDES, SW846, RCRA, etc.). Hence, EMAX shall apply the appropriate test as specified by the project requirement.

10.0 TEST METHODS AND STANDARD OPERATING PROCEDURES

10.1 METHODS DOCUMENTATION

EMAX shall have laboratory method manuals for all the analyses it performs. All EMAX written procedures shall follow the format and content parameters of EMAX-QA00 – Writing SOP.

The SOPs shall be downloaded online on EMAX local network and shall be maintained and controlled by the QA Department. These documents shall be published and accessed as "read only" files. All laboratory personnel shall be properly trained on how to use the EMAX SOP browser.

All instructions, standards, manuals and reference data relevant to the work of the laboratory shall be maintained up-to-date and be readily available to the staff.

EMAX shall maintain standard operating procedures that accurately reflect all phases of current laboratory activities. Refer to Section 10.2 for SOP organization. The first page of each SOP shall indicate the effective date of the document, the revision number and the signature(s) of the approving authority.

10.2 LIST TEST METHODS

TM No.	Title & Summary
EMAX-120.1	Specific Conductance This procedure is used to determine specific conductance of aqueous samples. This is an adaptation of EPA Method 120.1. The specific conductance of aqueous sample is measured by use of a self-contained conductivity meter, Wheatstone bridge-type, or equivalent. Soil and solid matrices are extracted with de-ionized water. The solution is then filtered and analyzed for specific conductance.
EMAX-130.2	Hardness This method is applicable to drinking, surface, and saline waters, domestic and industrial wastes. It is suitable for all concentration ranges of hardness. This method is an adaptation of EPA Method 130.2. Calcium and magnesium ions in the sample are sequestered upon the addition of disodium ethylenediamene tetraacetate (Na_2EDTA). The end point of the reaction is detected by means of Eriochrome Black T indicator, which has a red color in the presence of calcium and magnesium and a blue color when the cations are sequestered.

TM No.	Title & Summary
EMAX-150.1	pH, Electrometric This procedure describes the process of pH determination of aqueous samples. This SOP is an adaptation of EPA Method 150.1. The sample is brought to equilibrate with room temperature and a properly calibrated pH meter measures the sample pH.
EMAX-160.1	Residue, Filterable (TDS) This procedure is used to determine filterable residues in aqueous samples. This SOP is an adaptation of EPA Method 160.1. A known amount of sample is taken from a well-mixed sample and filtered through a glass fiber filter. The filtrate is dried to a constant weight at 180°C.
EMAX-160.2	Residue, Non-filterable (TSS) This procedure is used to determine non-filterable residues in aqueous samples. This SOP is an adaptation of EPA Method 160.2. A known amount of sample is taken from a well-mixed sample and filtered through a glass fiber filter. The filter is dried to a constant weight at 103-105°C.
EMAX-160.3	Residue, Total This procedure is used to determine the total residue in an aqueous sample. This SOP is an adaptation of EPA Method 160.3. A known amount of sample is taken from a well-mixed sample and dried to a constant weight at 103-105°C.
EMAX-180.1	Turbidity This procedure is used to determine suspended solids expressed in nephelometric turbidity units (NTU). This method is an adaptation of EPA Method 180.1. A nephelometric turbidity instrument is calibrated with a Formazin standard. The intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension is compared. The higher the intensity of scattered light, the higher the turbidity.

TM No.	Title & Summary
EMAX-218.6	Hexavalent Chromium This method is applicable for the determination of hexavalent chromium in: ground waters, reagent waters, by Ion Chromatography. This SOP is an adaptation of EPA Method 218.6. An aqueous sample is filtered through a 0.45 um filter and the filtrate is adjusted to a pH of 9.0 to 9.5 with a buffer solution. A measured volume of the sample (250-1000uL) is introduced into the ion chromatograph. A guard column removes organics from the sample before the Cr(VI) as CrO42-is separated on an anion exchange separator column. Post-column derivatization of the Cr(VI) with diphenylcarbazide is followed by detection of the colored complex at 530nm.
EMAX-300.0	Anions This procedure is used to determine the concentrations of common inorganic anions in aqueous samples and extracted solid samples by ion chromatography (IC). This SOP is an adaptation of EPA Method 300.0. A known volume of sample is processed through an IC to separate the anions. The separated anions are measured by conductivity and are identified on the basis of retention time as compared to analytical standards.
EMAX-305.1	Acidity This method measures the mineral acidity of a sample plus the acidity resulting from oxidation and hydrolysis of polyvalent cations, including salts of iron and aluminum. This is an adaptation of EPA Method 305.1 This method covers the range from approximately 10 mg/L acidity to approximately 1000 mg/L as $CaCO_3$ using a 50 ml sample. The pH of a sample is determined and a measured amount of standard and is added, as needed, to lower the pH to 4 or less. Hydrogen peroxide is added, the solution boiled for several minutes, cooled, and titrated electrometrically with standard alkali to pH 8.2.
EMAX-310.1	Alkalinity This procedure is used to measure alkalinity of aqueous samples by titration. This SOP is an adaptation of EPA Method 310.1 An unaltered amount of sample is titrated with standard acid titrant to an end point of pH=4.5.

TM No.	Title & Summary
EMAX-314.0	Ion Chromatography Analysis This method is applicable for the determination of perchlorate in drinking water, surface water, mixed domestic and industrial wastewaters, ground waters, reagent waters, solids, and leachate by Ion Chromatography. This SOP is an adaptation of EPA Method 314.0. A small amount of sample (1 ml) is injected into an ion chromatograph. The sample is passed through a guard column, anion exchange column, suppressor device and the anions are detected by a conductivity detector.
EMAX-325.3	Chloride This procedure is used to measure chloride concentration in aqueous samples by titration. This SOP is an adaptation of EPA Metod 325.3. A known amount of acidified sample is titrated with mercuric nitrate in the presence of mixed diphenylcarbazone-bromophenol blue indicator. The end point of the titration is determined by the formation of the blue-violet mercury diphenylcarbazone complex.
EMAX-330.3	Chlorine, Residual This procedure is used to determine residual chlorine in natural or treated waters. This SOP is an adaptation of EPA Method 330.3. A known amount of sample is adjusted to pH=4 and treated with potassium iodide (KI). Presence of chlorine will liberate free Iodine. Liberated iodine is titrated with sodium thiosulfate and starch indicator.
EMAX-335.1	Cyanide, Amenable This method is used to determine the amount of cyanide amenable to chlorination in aqueous samples. This SOP is an adaptation of EPA Method 335.1. Two samples are prepared, one for total cyanide and the other sample is chlorinated at a pH > 11 to decompose the cyanide. Both samples are then subjected to reflux-distillation and analyzed by colorimetry. The difference of total cyanide from that of the chlorinated cyanide determines the amount of cyanide amenable to chlorination.

TM No.	Title & Summary
EMAX-335.2	Cyanide, Total This method is used to determine the amount of cyanide in aqueous samples. This SOP is an adaptation of EPA Method 335.2. Sample is subjected to reflux-distillation to release cyanide in the form of hydrocyanic acid (HCN). The distillate is reacted with chloramine-T to concert cyanide ion to cyanogen chloride (CNCl). The solution is allowed to complete reaction. Pyridine-barbituric acid reagent is added for color development. The colorimeter is set to read absorbance at 578 nm. Absorbance of the sample is compared to the absorbance of the standard.
EMAX-350.2	Ammonia This method is used to determine ammonia as nitrogen in aqueous samples. This SOP is an adaptation of EPA Method 350.2. A known amount of sample is buffered at a pH of 9.5 with a borate buffer in order to decrease hydrolysis of cyanates and organic nitrogen compounds, and is then distilled into a solution of boric acid. The ammonia in the distillate is determined colorimetrically by nesslerization.
EMAX-351.3	Kjelkahl, Total (TKN) This method is used to determine TKN as nitrogen in aqueous samples. This SOP is an adaptation of EPA Method 351.3. A known amount of sample is subjected to acid digestion. The digestate is treated and converted to alkaline with a hydroxide-thiosulfate solution and distillation is carried out. The distillate is analyzed by colorimetry.
EMAX-360.1	Oxygen, Dissolved This method is used to determine dissolved oxygen in aqueous samples. This is an adaptation of EPA Method 360.1. A known amount of sample is analyzed by membrane electrode.
EMAX-365.2	Phosphorus, All Forms This method describes the process of determining specific forms of phosphorus in drinking, surface, saline, domestic, industrial wastewaters and other aqueous samples. This method is an adaptation of EPA Method 365.2. Orthophosphate is determined by direct colorimetry at 650 nm. Hydrolyzable phosphorus are hydrolyzed with H_2SO_4 to form orthophosphate. Total phosphorus is converted to orthophosphate by persulfate digestion. Dissolved forms of phosphorus are determined by filtering the sample through 0.45µm prior to sample processing.

TM No.	Title & Summary
EMAX-376.1	Sulfide This method is used to determine total and dissolved sulfides in aqueous samples. This SOP is an adaptation of EPA Method 376.1. A known amount of sample is acidified with HCl and oxidized with standard iodine solution to convert sulfides to sulfur. The solution is back titrated with phenylarsine oxide solution (PAO).
EMAX-405.1	Biochemical Oxygen Demand (BOD) This method is used to measure the dissolved oxygen consumed by microbial life while assimilating and oxidizing the organic matter present. This is an adaptation of EPA Method 405.1. A known amount of sample is subjected to 5-day incubation at 20° C. Dissolved oxygen (DO) is measured before and after incubation. BOD is computed from the difference of the initial and final DO.
EMAX-410.4	Chemical Oxygen Demmand (COD) This method determines the quantity of oxygen to oxidize organic matter in an aqueous sample. This SOP is an adaptation of EPA Method 410.4. A known amount of sample is oxidized with potassium dichromate in 50% sulfuric acid solution at reflux temperature. Silver sulfate is usedd as a catalyst and mercuric sulfate is added to remove chloride interference. The excess dichromate is titrated with standard ferrous ammonium sulfate, using orthophenanthroline ferrous complex as an indicator. The oxidized organic matter is calculated in terms of oxygen equivalent.
EMAX-413.1	Oil & Grease This method is used to determine the amount of substances soluble in flurocarbon-113 by infrared spectrometry. This is an adaptation of EPA Method 413.1. Sample bottles are marked at the sample meniscus for sample amount determination. Total recoverable oil and grease is extracted at pH < 2 from a bottle of sample using Freon 113. The solvent is subsequently subjected to a gentle stream of nitrogen until the solvent is completely evaporated. The vial is then weighed to determine the amount of oil and grease in the sample..
EMAX-413.2	Oil & Grease This method is used to determine the amount of substances soluble in flurocarbon-113 by infrared spectrometry. This is an adaptation of EPA Method 413.2. The entire sample is extracted with a measured amount of fluorocarbon-113 solvent. Oil and grease is determined by comparing the infrared absorbance of the sample extract with the analytical standards.

TM No.	Title & Summary
EMAX-415.1	Organic Carbon, Total (TOC) This method is used to determine total organic carbons in an aqueous sample by combustion-infrared technique. This SOP is an adaptation of EPA Method 415.1. A small amount of sample (5µL) is combusted at high temperature (680° C) to convert total carbons (TC) to CO_2. The same amount of sample is heated at a lower temperature (150° C) to convert inorganic carbons (IC) to CO_2 . An infrared analyzer measures the converted CO2. TOC is determined by subtracting IC from TC.
EMAX-418.1	Total Petroleum Hydrocarbon, Recoverable (TRPH) This method is used to determine total recoverable petroleum hydrocarbon in aqueous samples by infrared spectrometry. This SOP is an adaptation of EPA Method 418.1. The total amount of sample is extracted with fluorocarbon-113 and the extract is cleaned-up with silica gel to remove interference. TRPH is determined by comparing the infrared absorbance of the sample extract with the analytical standards.
EMAX-420.1	Phenolics, Total Recoverable This method is used to determine the amount of phenols in aqueous samples. This SOP is an adaptation of EPA Method 420.1. A known amount of sample is distilled with phosphoric acid solution to induce phenol reaction with 4-aminoantipyrine in the presence of potassium ferricyanide and form a stable reddish-brown antipyrine dye. The amount of phenolics is measured by colorimetry at 460 nm.
EMAX-504	EDB & DBCP This method is used to determine 1,2-Dibromoethane (EDB) and 1,2-Dibromo-3-chloropropane (DBCP) in drinking water. This SOP is an adaptation of EPA Method 504. Thirty-five ml of sample is extracted with 2-ml of hexane. GC with ECD analyzes the extract.
EMAX-524.2	Purgeable Organic Compounds This method is used to determine volatile organic compounds in drinking water. This SOP is an adaptation of EPA Method 524.2. A known amount of sample is subjected to purge and trap and analyzed by GCMS.

TM No.	Title & Summary
EMAX-1010	Ignitability This method is used to determine ignitability of liquids by Pensky-Martems close-cup method. This SOP is an adaptation of SW846 Method 1010. The sample is slowly heated at a constant rate of 5° C/minute with continuous stirring until it reaches a temperature about 15° C below the expected flash point. The heating rate is adjusted to 3° C/minute. A small flame is directed to the sample cup (test flame), simultaneously interrupting the stirring at every 1° C rise in temperature. The lowest temperature at which the vapor above the sample ignites upon a test flame determines its ignitability.
EMAX-3005	Acid Digestion, Total Recoverable or Dissolved This method is used for digestion of aqueous samples in preparation for total recoverable or dissolved metals analysis. This SOP is an adaptation of SW846 Method 3005A. A known amount of sample is heated with acid and substantially reduced in volume. The digestate is adjusted to its original volume with de-ionized water.
EMAX-3010	Acid Digestion, Total Metals for Aqueous This method is used for digestion of aqueous samples in preparation for total metals analysis. This SOP is an adaptation of SW846 Method 3010A. A known amount of sample is serially refluxed with nitric acid until the color is light or unchanged. HCl is added for final reflux. The digestate is adjusted to its original volume with de-ionized water.
EMAX-3020	Acid Digestion, Total Metals for GFAA This method is used for digestion of aqueous samples in preparation for total metals analysis by GFAA. This SOP is an adaptation of SW846 Method 3020A. A known amount of sample is serially refluxed with nitric acid until the color is light or unchanged. The digestate is adjusted to its original volume using de-ionized water with nitric acid such that the final volume contains 3% nitric acid.

TM No.	Title & Summary
EMAX-3050	Acid Digestion, Total Metals for Solids This method is used for digestion of sediments, sludges and soil samples in preparation for total metals analysis. This SOP is an adaptation of SW846 Method 3050B. A known amount of sample (normally 1-g) is serially refluxed with nitric acid and oxidized with hydrogen peroxide. Samples for GFAA analysis are filtered and diluted to 100-ml final volume. Samples for ICP analysis are subjected to HCl final reflux. The digestate is filtered and diluted to 100-ml final volume.
EMAX-3510	Extraction, Separatory Funnel This method is used for extraction of organic compounds from aqueous samples. This is an adaptation of SW846 Method 3510C. A known amount of sample at specified pH, is serially extracted with methylene chloride using a separatory funnel. The extract is passed through a drying bed of sodium sulfate and concentrated. As necessary, the extract is solvent exchanged and/or goes through extract cleanup as dictated by the analytical method.
EMAX-3520	Extraction, Continuous Liquid-Liquid This method is used for extraction of organic compounds from aqueous samples. This is an adaptation of SW846 Method 3520C. A known amount of sample at specified pH, is extracted with methylene chloride using a continuous liquid-liquid extractor. The extract is passed through a drying bed of sodium sulfate and concentrated. As necessary, the extract is solvent exchanged and/or goes through extract cleanup as dictated by the analytical method.
EMAX-3540	Extraction, Soxhlet This method is used for extraction of organic compounds from sediments and soil samples. This is an adaptation of SW846 Method 3540C. A known amount of sample is extracted with methylene chloride using a soxhlet extractor. The extract is passed through a drying bed of sodium sulfate and concentrated. As necessary, the extract is solvent exchanged and/or goes through extract cleanup as dictated by the analytical method.

TM No.	Title & Summary
EMAX-3545	Extraction, ASE This method is used for extraction of organic compounds from sediments and soil samples. This is an adaptation of SW846 Method 3545C. A known amount of sample is extracted with methylene chloride using an accelerated solvent extractor. The extract is passed through a drying bed of sodium sulfate and concentrated. As necessary, the extract is solvent exchanged and/or goes through extract cleanup as dictated by the analytical method.
EMAX-3550	Extraction, Pulse Sonication This method is used for extraction of organic compounds from sediments and soil samples. This is an adaptation of SW846 Method 3550C. A known amount of sample is serially extracted with methylene chloride using a pulse sonication. The extract is passed through a drying bed of sodium sulfate and concentrated. As necessary, the extract is solvent exchanged and/or goes through extract cleanup as dictated by the analytical method.
EMAX-3580	Waste Dilution This method is used for extraction of organic compounds in pure products and highly concentrated samples that are solvent soluble. This SOP is an adaptation of SW846 Method 3580. A known amount of sample is diluted with extraction solvent to 10-ml volume. As necessary, the extract is solvent exchanged and/or goes through extract cleanup as dictated by the analytical method.
EMAX-5030	Purge & Trap for Aqueous Samples This method describes the preparation process of aqueous and aqueous soluble samples, highly concentrated soils and waste extracts for volatile analysis. This SOP is an adaptation of SW846 Method 5030B. A known amount of sample is purged with inert gas to bring the organic compounds to vapor phase. The vapor is passed through a sorbent trap to collect the organic compounds. The trap is desorbed with the inert gas and backflushed to a GC column and analyzed according the requirements of the determinative method.
EMAX-5035	Closed-System Purge & Trap for Soil Samples This method describes the process of soil sample preparation for volatile analysis. This SOP is an adaptation of SW846 Method 5030B. Samples are collected in a closed-system container. The low soil method utilizes a hemetically sealed sample vial, which remains sealed until the time for analysis. This procedure also includes the preparation of methanol extraction for high concentration samples. The extracts are treated as described in method 5030B.

TM No.	Title & Summary
EMAX-6010	Metals by ICP This method is used to determine trace metals from aqueous samples and digestates from solid and/or leachate samples. This SOP is an adaptation of SW846 Method 6010B. A known amount of sample/digestate is injected into an inductively coupled plasma (ICP) instrument, which measures characteristic emission spectra, by optical spectrometry.
EMAX-7000	Metals by GFAA This method is used to determine trace metals from aqueous samples and/or digestates from solid or leachate samples by graphite furnace atomic absorption (GFAA). This is SOP is an adaptation of SW846 Method 7000 but is limited to the following analytes only: Antimony (7041), Arsenic (7060A), Chromium (7192), Copper (7201), Lead (7421), Lithium (M7430), Nickel (7521), Selenium (7740), Silver (7761), Thallium (7841), and Vanadium (7911). A known amount of sample/digestate is injected to a GFAA instrument setup to appropriate parameters specific to the element being analyzed. The sample is dried, charred and atomized. Atomic absorbance is measured by the spectrometer and linearized with the calibration curve.
EMAX-7195	Chromium, Hexavalent by Coprecipitation This method is used to determine dissolved hexavalent chromium from aqueous and leachate samples by coprecipitation technique. This SOP is an adaptation of SW846 Method 7195. A known amount of sample is acidified with acetic acid. Lead nitrate and ammoium sulfate is added and centrifuged. Hexavalent chromium is coprecipitated with lead sulfate. The precipitate is digested with nitric acid. The digestate is analyzed by GFAA.
EMAX-7196	Chromium, Hexavalent by Colorimetry This method is used to determine dissolved hexavalent chromium from aqueous and leachate samples by colorimetry. This SOP is an adaptation of SW846 Method 7196. A known amount of sample is made to react with diphenylecarbazide in acidic solution. A red-violet color is produced. The absorbance of the sample is compared to the analytical standards.

TM No.	Title & Summary
EMAX-7199	Hexavalent Chromium This method is applicable for the determination of hexavalent chromium in: ground waters, reagent waters, by Ion Chromatography. This SOP is an adaptation of EPA Method 7199. An aqueous sample is filtered through a 0.45 um filter and the filtrate is adjusted to a pH of 9.0 to 9.5 with a buffer solution. A measured volume of the sample (250-1000uL) is introduced into the ion chromatograph. A guard column removes organics from the sample before the Cr(VI) as CrO42-is separated on an anion exchange separator column. Post-column derivatization of the Cr(VI) with diphenylcarbazide is followed by detection of the colored complex at 530nm.
EMAX-7470	Mercury In Liquid Waste This method is used to determine mercury in aqueous samples and leachates by cold vapor technique. This SOP is an adaptation of SW846 Method 7470A. A known amount of sample is digested with nitric and sulfuric acid to breakdown organic mercurials. It is further oxidized with potassium permanganate and potassium persulfate to oxidize organo-mercury compounds. The digestate is analyzed by cold vapor absorption technique and absorbance is measured as a function of mercury concentration.
EMAX-7471	Mercury in Solid and Semisolid Waste This method is used to determine mercury in solid samples by cold vapor technique. This SOP is an adaptation of SW846 Method 7471A. A known amount of sample is digested with nitric and sulfuric acid to breakdown organic mercurials. It is further oxidized with potassium permanganate and potassium persulfate to oxidize organo-mercury compounds. The digestate is analyzed by cold vapor absortion technique and absorbance is measured as a function of mercury concentration.
EMAX-8011	EDB & DBCP This method is used to determine 1,2-Dibromoethane and 1,2-Dibromo-3-choropropane in aqueous samples. This SOP is an adaptation of SW846 8011. Thirty-five ml of sample is extracted with 2 ml of hexane and analyzed with Gas Chromatography equipped with Electron Capture Detector (ECD).

TM No.	Title & Summary
EMAX-8015E	Total Petroleum Hydrocarbon, Extractable (TPHE) This method is used to determine extractable total petroleum hydrocarbons. This SOP is an adaptation of SW846 Method 8015B. A known amount of sample is extracted with appropriate solvent and analyzed by Gas Chromatography equipped with Flame Ionization Detector (FID) calibrated for designated fuels (Diesel, JP5, Motor Oil, etc.)
EMAX-8015P	Total Petroleum Hydrocarbon, Purgeable (TPHP) This method is used to determine purgeable total extractable petroleum hydrocarbons. This SOP is an adaptation of SW846 Method 8015B. A known amount of sample is subjected to purge and trap and analyzed by Gas Chromatography equipped with Flame Ionization Detector (FID) calibrated for designated fuels (Gasoline, JP4, etc.)
EMAX-BTEXM	Volatile, Aromatic and Halogenated by GC This method is used to determine total purgeable petroleum hydrocarbons organics. This SOP is an adaptation of SW846 Method 8021B. A known amount of sample is subjected to purge and trap and analyzed by Gas Chromatography equipped with Photoionization detector and Electrolytic Conductivity Detector (HEDC) in series.
EMAX-8081	Pesticides, Organochlorine by GC This method is used to determine organochlorine pesticides. This SOP is an adaptation of SW846 Method 8081A. A known amount of sample is extracted with methylene chloride and solvent exchanged to hexane. The extract is concentrated and analyzed by Gas Chromatography equipped with Electron Capture Detector (ECD).
EMAX-8082	Polychlorinated Biphenyls (PCBs) by GC This method is used to determine PCBs. This SOP is an adaptation of SW846 Method 8082. A known amount of sample is extracted with methylene chloride and solvent exchanged to hexane. The extract is concentrated and analyzed by Gas Chromatography equipped with Electron Capture Detector (ECD)

TM No.	Title & Summary
EMAX-8151	Herbicides, Chlorinated by GC This method is used to determine chlorinated herbicides. This SOP is an adaptation of SW846 Method 8151A. A known amount of sample is extracted and esterified with diazomethane. The extract is analyzed by Gas Chromatography equipped with Electron Capture Detector (ECD)
EMAX-8260	Volatile Organic Compounds by GCMS This method is used to determine volatile organic compounds by GCMS. This SOP is an adaptation of SW846 Method 8260B. A known amount of sample is subjected to appropriate purge and trap technique and analyzed by Gas Chromatography equipped with Mass Spectrometer.
EMAX-8270	Semivolatile Organic Compounds by GCMS This method is used to determine semivolatile organic compounds by GCMS. This SOP is an adaptation of SW846 Method 8260B. A known amount of sample is subjected to appropriate extraction technique and the extract is analyzed by Gas Chromatography equipped with Mass Spectrometer.
EMAX-8310	Polynuclear Aromatic Hydrocarbons (PAH) by HPLC This method is used to determine PAHs. This SOP is an adaptation of SW846 Method 8310. A known amount of sample is extracted with methylene chloride and solvent exchanged to acetonitrile. The extract is concentrated and anlayzed by High Performance Liquid Chromatography with UV and Fluorescence Detectors.
EMAX-8330	Nitroaromatics & Ntiramines by HPLC This method is used to determine trace levels of explosive residues. This SOP is an adaptation of SW846 Method 8330. A known amount of sample is extracted with acetonitrile. The extract is concentrated and anlayzed by High Performance Liquid Chromatography with UV Detectors. Tentatively identified analytes are confirmed by the use of another column.

TM No.	Title & Summary
EMAX-9010	Distillation, Cyanide This method describes the process of reflux-distillation to extract cyanide from wastes and leachates. This SOP is an adaptation of SW846 Method 9010B. Two sample aliquots are prepared, one for total cyanide and the other sample is for cyanide amenable for chlorination (pH adjusted to > 11 to decompose the cyanide). Both samples are then subjected to reflux-distillation and analyzed by SW846 9014. The difference of total cyanide from that of the chlorinated cyanide determines the amount of cyanide amenable to chlorination.
EMAX-9014	Cyanide This method is used to measure cyanide concentration from alkaline distillate. This SOP is an adaptation of SW846 Method 9014. The distillate is reacted with chloramine-T to concert cyanide ion to cyanogen chloride (CNCl). The solution is allowed to complete reaction. Pyridine-barbituric acid reagent is added for color development. The colorimeter is set to read absorbance at 578 nm. Absorbance of the sample is compared to the absorbance of the standard
EMAX-9030	Sulfides, Total This method is used to determine total and dissolved sulfides in aqueous samples. This SOP is an adaptation of EPA Method 9030/9034. A known amount of sample is acidified with HCl and oxidized with standard iodine solution to convert sulfides to sulfur. The solution is back titrated with phenylarsine oxide solution (PAO).
EMAX-9040	pH, Waste Samples This method is used to measure pH of aqueous wastes and multiphase wastes having aqueous at least 20% of the waste volume. This SOP is an adaptation of SW846 Method 9040B. The pH of a sample is determined electrometrically using combination electrode calibrated by series of pH standards.
EMAX-9045	pH, Solid and Waste Samples This method is used to measure pH of soils and wastes containing <20% aqueous phase of the sample volume. This SOP is an adaptation of SW846 Method 9045C. A known amount of sample is mixed with reagent water. The pH of a sample is determined electrometrically using combination electrode calibrated by series of pH standards.

TM No.	Title & Summary
EMAX-9050	Specific Conductance This method is used to measure specific conductance of aqueous samples. This SOP is an adaptation of SW846 Method 9050A. Sample is place in the instrument sample cup and specific conductance is read with a temperature correction at 25°C.
EMAX-9060	Organic Carbon, Total (TOC) This method is used to determine total organic carbons in an aqueous sample by combustion-infrared technique. This SOP is an adaptation of EPA Method 9060. A small amount of sample (5µL) is combusted at high temperature (680° C) to convert total carbons (TC) to CO_2. The same amount of sample is heated at a lower temperature (150° C) to convert inorganic carbons (IC) to CO_2 . An infrared analyzer measures the converted CO2. TOC is determined by subtracting IC from TC.
EMAX-1664	Oil & Grease This method is applicable for determination of Total Recoverable Oil and Grease in surface and saline waters, industrial and domestic aqueous wastes, by gravimetric method. This SOP is an adaptation of Method 1664. Sample bottles are marked at the sample meniscus for sample amount determination. Total recoverable oil and grease is extracted at $pH < 2$ from a bottle of sample using Hexane. The extract is concentrated to about 5 ml and is quantitatively transferred into a pre-weighed scintillation vial. The solvent is subsequently subjected to a gentle stream of nitrogen until the solvent is completely evaporated. The vial is then weighed to determine the amount of oil and grease in the sample. Sample amount is determined by pouring tap water into the original sample bottle up to the previously marked sample meniscus and later measuring its contents with a graduated cylinder.
EMAX-2130B	Turbidity by Nephelometric Method The method is based upon a comparison of the intensity of light scattered by the sample under defined conditions with the intensity of light scattered by a standard reference suspension. The higher the intensity of scattered light, the higher the turbidity. This method is use to determine turbidity by nephelometric method. This method is applicable for drinking water, ground water and other aqueous samples of similar matrix. This SOP is an adaptation of Standard Method 2130B. The turbidity meter is calibrated according to the manufacturer's operating instruction. Turbidity free water and a 20 NTU standard are analyzed to check the calibration of the turbidity meter. Samples are transferred in a 40-ml vial and analyzed as the standards.

TM No.	Title & Summary
EMAX-2320B	Alkalinity This process determines the alkalinity of aqueous samples. Alkalinity of water is its acid neutralizing capacity. It is the sum of titratable bases. Applying the same principle, alkalinity of soil may also be determined by leaching the matrix with reagent water and analyzing the leachate for alkalinity. This method is applicable in drinking water, surface and saline waters, domestic and industrial wastes, soil, sediments, sludge and other related substances. This procedure is an adaptation of Standard Methods 2320B.
EMAX-2340C	Hardness, Total This method is applicable to drinking, surface, and saline waters, domestic and industrial wastes. It is suitable for all concentration ranges of hardness. This method is an adaptation of Standard Methods 2340C. An unaltered sample is titrated to an electrometrically-determined endpoint of pH 4.5. Solid matrices are leached with reagent water prior to titration.
EMAX-2540C	Residue, Filterable (TDS) This method describes the determination of filterable residue (TDS) in drinking waters, groundwater samples and other aqueous samples of similar matrix. This method is an adaptation of Standard Method 2540C. A well-mixed known amount of sample is filtered through a glass fiber filter. The filtrate is collected into a pre-weighed evaporating dish and dried to a constant weight at 180 oC. The increase of weight in the dish represents the filterable residue.
EMAX-2540D	Residue, Non-Filterable (TSS) This method describes the determination of nonfilterabel residue (TSS) in drinking waters, groundwater samples and other aqueous samples of similar matrix. This method is an adaptation of Stantard Method 2540D. A well-mixed known amount of sample is filtered through a pre-weighed glass fiber filter. The filter is collected into a pre-weighed evaporating dish and dried to a constant weight at 103-105 oC. The increase of the weight of the filter represents the non filterable residue.

TM No.	Title & Summary
EMAX-5210B	Biochemical Oxygen Demand (BOD) This method is used to measure the dissolved oxygen consumed by microbial life while assimilating and oxidizing the organic matter present. This is an adaptation of Stantard Method 5210B. A known amount of sample is subjected to 5-day incubation at 20° C. Dissolved oxygen (DO) is measured before and after incubation. BOD is computed from the difference of the initial and finals DO.
EMAX-5220B	Chemical Oxygen Demmand (COD) This method determines the quantity of oxygen to oxidize organic matter in an aqueous sample. This SOP is an adaptation of Standard Method 5220B. A known amount of sample is oxidized with potassium dichromate in 50% sulfuric acid solution at reflux temperature. Silver sulfate is usedd as a catalyst and mercuric sulfate is added to remove chloride interference. The excess dichromate is titrated with standard ferrous ammonium sulfate, using orthophenanthroline ferrous complex as an indicator. The oxidized organic matter is calculated in terms of oxygen equivalent.
EMAX-5310	Dissolved Oxygen (DOC) This method is used to determine dissolved oxygen (DOC) in an aqueous sample by combustion-infrared technique. This procedure is only applicable to homogenous samples. This SOP is an adaptation of Standard Method 5310B. An aliquot of acidified sample is injected into the Analyzer, sparge with gas to remove IC content, and heated at 680oC to convert IC to Dissolved Oxygen.
EMAX-5520	Oil & Grease This method is used to determine the amount of substances soluble in flurocarbon-113 by infrared spectrometry. This is an adaptation of Standard Method 5520. The entire sample is extracted with a measured amount of fluorocarbon-113 solvent. Oil and grease is determined by comparing the infrared absorbance of the sample extract with the analytical standards.

10.2.1 METHOD PROFICIENCY

Analyzing a minimum of four laboratory control samples per matrix, processed and analyzed as described by the test method manuals, shall validate initial demonstration of capability for each analytical method. Method Detection Limit Study shall also be performed and verified prior to approval for the analytical method to take effect.

Continuing demonstration of method performance shall be demonstrated per method quality control requirements, demonstrated by monitoring negative and positive controls, proficiency testing and control charts.

A new demonstration of capability is performed whenever there is a significant change in instrument type, personnel, or test method.

10.3 SAMPLE ALIQUOT

Proper sub-sampling and representative amount of sample for each analytical process is detailed in the Test Manuals. The documentation process to uniquely identify each sub-sample is also detailed in the EMAX-SM04.

10.4 DOCUMENTATION & LABELING OF ANALYTICAL STANDARDS & REAGENTS

Requirements for documentation and labeling of analytical standards and reagents are detailed in EMAX-QC02 SOP. All analytical standards are purchased certified (where available) and are logged in a controlled analytical standard log upon receipt. A unique ID is given to the analytical standard upon receipt. This ID is written in the certificate of analysis for traceability purposes. At aminimum the following information is recorded upon receipt:

- Standard ID, name, source, lot number, received on, received by expiration date and the storage location
- All prepared standards are documented to be traceable to the parent name and ID. At a minimum the following information are documented.
- Parent Standard Information: Parent ID, name, concentration, aliquot taken, expiration date
- Prepared Standard Information: Standard ID, name, solvent ID, solvent name, final volume, final concentration, expiration date, preparation date, initial of the repairer.

10.5 ELECTRONIC DATA MANAGEMENT

10.5.1 DATA DELIVERABLES GENERATION

10.5.1.1 Data And Report Generation

All hardcopy deliverables shall be reported using established and certified data and report generation programs and the following established reporting procedures. Instrument data in electronic form shall be read as input files to EMAX's applications programs to generate hard copy and electronic reports. Reports from bench sheets shall be entered manually through the same application programs. Data inconsistencies shall be resolved following established corrective action procedures.

All samples logged on to the LIMS shall be stored in the network share \\TONTS40ENT01\LABWORKS.

Reports and their associated raw data shall be generated in the network share \\TOWIN2000S01\REPORT.

Project specifications shall be stored in the network share \\TOWIN2000S01\PMETHOD.

Electronic Disk Deliverables (EDD) Generation

This is a major task which requires the most applications programming work. This is because of the varied EDD formats. Each client potentially has its own EDD format. Since the input requirements can be generalized to be fairly uniform and constant over the different output requirements, program development can be done more easily.

All non-EPA standard disk deliverable programs shall be developed in-house. Development of EDD generation programs shall follow the general systems development guidelines established in this DMQAP.

EDDs shall be stored in the network share \\TOWIN2000S01\VOLUME2\EDD.

EDD documentation and guidelines for generation and validation shall be stored in the network share \\TONTS40ENT01\EDD\DOCUMENTATION\eddIndex.htm.

10.5.1.2 Input, Output, And Processing Control

EMAX shall establish control by ensuring that established procedures are properly followed. Control procedures shall be established in the following areas: data capture, preparation and input; manual and clerical procedures; programming logic and internal computer processing, and output and distribution of reports.

All data (raw and computed) must be handled and processed properly throughout the data processing system to avoid propagating errors. Control procedures must be established to detect and recover from hardware malfunctions; human mistakes in data input, transcription, and interpretation; and processing errors.

10.5.1.3 Data Capture And Input Verification

All raw data shall be input as close to the source as possible. Data manually input through the keyboard shall go through a validation process before the same data can undergo processing. Data verification shall come in the form of visual verification on the screen and through printed review sheets.

Data capture shall be limited to persons responsible and trained for for the operation. For example, login of sample information shall be performed only by the sample data entry operator, extraction data entry shall be done only by the extraction technician, and analysis run information shall be input only by the chemist. Where possible, the person who made the error shall be responsible for correcting it.

10.5.1.4 Processing And Output Controls

All application programs shall have data validation routines. The data shall undergo completeness checks, limit, range and value checks, format checks, and combination checks before they are processed. Calculations shall be based on standard formulas. Output data shall be reconciled with the various parameters and controls established for input and processing. Output data shall be presented in concise form, and it shall be verified for accuracy and completeness. Procedures shall be established to ensure the timely distribution of the output reports to the intended persons.

10.5.2 SECURITY

EMAX's hardware, software and information resources are valuable company assets and must be managed efficiently to ensure data integrity, security, and maximum resource availability for the company's business operations. EMAX shall establish security standards and procedures to manage these resources and to facilitate access and sharing of these resources.

EMAX's security policy applies to all computer resources, including local area networks, systems, and applications used to process LIMS and administrative data. It also applies to all users, including those who install, develop, maintain, administer, and use those systems, applications, and data for the Company.

Guidelines and procedures shall be established for policy development and maintenance, information security responsibilities, access controls, and operational controls.

10.5.3 ACCESS CONTROL, BACKUP AND RECOVERY

10.5.3.1 Access Control

Access controls shall be specified for all LIMS and administrative files. All users of Company data must be authorized to access the appropriate systems and their resources. Access is controlled and monitored in accordance with Company policy. Copies of data, regardless of location, have the same data security and access control requirements as operational data. The elements involved in controlling and monitoring this access include identification, authentication, and authorization.

Access levels are determined by the user's or user group's data access privileges. Access is granted by means of a computer account, which serves as identification. A computer account is created based on an approved request for network account.

10.5.3.2 Backup And Archival

All critical LIMS and administrative data must be backed up on a regular basis. Files stored in servers shall be backed up daily. Workstation data shall be backed up at a frequency established by the user who generates the data. This frequency is influenced by the rate of generation of new data, the rate with which the data changes, and the effort required to recreate information, if it is lost.

Backup and archival methods shall be defined for all data files. Backup data shall be used to recover data when files have been destroyed. Archived data shall be kept for future reference. Retention times shall be defined for archived data.

Provisions shall be made for off-site storage of daily and archival back ups.

10.5.3.3 Routine And Disaster Recovery

Recovery procedures shall complement the backup methods and procedures by defining how files will be restored if they are deleted, lost, damaged, or stolen.

All archival backups of critical data must be tested periodically to ensure that they still support full system recovery. Restoration procedures shall be documented. Backup media must be retrievable within 24 hours, 365 days a year.

10.6 STANDARD OPERATING PROCEDURES

EMAX Standard Operating Procedures (SOP) are downloaded to the network for employees' easy access. SOP revisions are announced during QA meetings so that concerned personnel can review them accordingly. These SOPs are "read-only" files and, for document control purposes, can only be printed by the QA Department upon request. SOPs are reviewed at least once a year and revised as necessary. Department Supervisors and/or Managers review SOPs pertinent to their Department to ensure that they are currently practiced as prescribed by approved methods and the QA manual.

10.6.1 QUALITY ASSURANCE SOPS

Quality Assurance Procedures are guidelines to augment execution and compliance to overall quality assurance objectives and policies.

SOP No.	Title & Summary

SOP No.	Title & Summary
EMAX-QA00	Writing SOP The purpose of this SOP is to describe the required content and organization of a standard operating procedure (SOP). It illustrates the typical format of a SOP. It also characterizes the assignment of SOP numbers, approval processes, control of document distribution, filing new revisions, and archiving old editions, and establishes a policy on professional ethics. It establishes a standard guideline to provide a uniform and reproducible result.
EMAX-QA01	Project Management This procedure describes the process of conducting project management. The process shall also describe the functions of project management internally and externally. The internal function is to disseminate information within the system and ensures that final product conforms to the project's requirements. The external function is to interact with the client in relation to the project. This procedure is applicable but not limited to federal environmental cleanup and monitoring projects (i.e., US Air Force, US Navy, US Army and other projects of similar nature).
EMAX-QA02	Utilization of Subcontract Laboratories This procedure describes the process in the event that a sub-tiered, secondary laboratory referred to as "Subcontractor(s)" is needed to complete a particular project. The subcontractor(s) has to be qualified with the appropriate certifications, approvals, validations and licenses to perform the work as EMAX, and written Client approval must be granted to EMAX prior to utilizing the Subcontractor(s).
EMAX-QA03	Method Development This procedure describes the process of establishing new methods as well as improvement on existing methods requiring new techniques. The SOP for the method to be established is written at this stage and is fine-tuned until the expected process is successfully achieved. The method development is culminated with the performance of Method Detection Limit Study, Determination of Reporting Limits and Accuracy & Precision.
EMAX-QA04	IDL/MDL/RL This procedure establishes the policy and describes the system of generating Instrument Detection Limit (IDL), Method Detection Limit (MDL) and Reporting Limit (RL).
EMAX-QA05	Training This procedure describes the training policies and processes used by EMAX to ensure that its staff members are knowledgeable and competent. It also describes how staff proficiency is evaluated, documented and reviewed initially and continually.

SOP No.	Title & Summary
EMAX-QA06	Control Chart This procedure describes the charting of quality control parameters from laboratory control samples and assigned QC samples. This provides a useful tool to assess the quality control efforts and to improve the analytical process.
EMAX-QA07	Systems Audit The purpose of this SOP is to establish a Systems Audit to assess the different laboratory operations in compliance to the Quality Assurance Manual. It efficiently evaluates the laboratory performance, brings attention to systematic error(s), focuses on possible cause(s) and/or suggestions for improvement, as well as determines whether the quality requirements are met.
EMAX-QA08	Corrective Action Corrective action is a QA program that provides a system to resolve problems and restore proper functioning of laboratory operation when error, deficiencies or out-of-control situations surface. It also describes the process of responding to achieve closure to external evaluations, complaints and other related issues that may require corrective action.

10.6.2 SUPPLEMENTAL QUALITY CONTROL PROCEDURES

Supplemental Quality Control Procedures are guidelines to establish controls that are auxiliary to Analytical and QA Procedures.

SOP No.	Title & Summary
EMAX-QC01	Quality Control for Chemicals The purpose of this SOP is to describe the process of quality control of chemicals used in the analytical process. It also describes the documentation and information dissemination of analytical results. All chemicals used in the analytical process shall undergo quality control.
EMAX-QC02	Analytical Standard Preparation This procedure provides laboratory analysts a guideline on standard preparation and documentation procedure. The procedure applies to all laboratory standard preparations in organic, metal, wet chemistry and sample preparation departments. All analytical standards must be certified by the vendor as well as traceable and verifiable to a standard reference material (i.e., NIST or any other agencies known to have similar function and credential).

SOP No.	Title & Summary
EMAX-QC03	Refrigerator Control The purpose of this SOP is to describe the process of implementing monitoring and control of refrigerators and freezers. This shall include the refrigerators and freezers used for storage of samples, extracts and standards
EMAX-QC04	Balance Calibration This SOP describes the calibration of laboratory balances. This process is applicable to all laboratory balances used in any analytical procedure. All balances shall be checked against certified weights at least once a day to ensure that the balances are properly functioning.
EMAX-QC05	Thermometer Calibration This procedure describes how thermometers used in the laboratory are calibrated. This process is applied to thermometers used to monitor sample storage refrigerators as well as those that are used to check cooler temperatures. It also applies to all other thermometers used in the laboratory. A calibrated Standard thermometer is used to check the thermometers used in the laboratory.
EMAX-QC06	Micropipet Calibration This procedure describes the process of calibrating micropipettes used in the laboratory. All micropipettes used in the laboratory shall be assured that they are operating accurately. Reagent water is used as the calibration solution.
EMAX-QC07	Glassware Cleaning This SOP describes the standard treatment of labware used in relation to the different analyses performed in the laboratory. The procedure involves proper decontamination of the labware and disposing of waste generated during the process. All reusable labware utilized in the analytical process shall be properly decontaminated prior to its use

10.6.3 DATA MANAGEMENT PROCEDURES

Data Management Procedures are guidelines to establish data control from generation to archival. EMAX maintains all data generated in a secured place for a minimum of five years.

SOP No.	Title & Summary
EMAX-DM01	Data Flow & Review This procedure describes the system of data flow and review process for analytical results produced at EMAX. This process includes, but is not limited to, data generation, documentation, reduction formats, review, reporting and validation

SOP No.	Title & Summary
EMAX-DM02	Document Control The procedure describes the process of document control. It covers the generation of control numbers, distribution, control, and archival of controlled documents. The control process applies to Standard Operating Procedures (SOPs), Quality Assurance Manual, Laboratory Logbooks, and other related documents that have similar importance for the proper operation of the laboratory.
EMAX-DM03	Data Package Assembly and Archival This procedure establishes the policy and describes the process of data packaging for each delivery group. It also describes the system of data package archiving and retrieving to ensure orderliness and ease when historical data is needed.

10.6.4 INFORMATION SYSTEMS PROCEDURES

Information Systems Procedures are guidelines to manage electronic media from software development to electronic data archival.

SOP No.	Title & Summary
EMAX-IS01	Software Documentation This procedure describes the guidelines for software documentation to provide for easier program maintenance, to provide users the information needed to operate the software, and to furnish auditors with information about the controls that have been established in the program.
EMAX-IS02	Software Development Methodology This procedure establishes the LIMS software development methodology to meet the greater objectives of software reliability, accuracy, flexibility, and acceptability. It is also required to reduce costs and save time in software development and software maintenance.
EMAX-IS03	Software Testing and Quality Assurance This procedure focuses on specific software test and acceptance guidelines for all in-house software projects for managing LIMS data. This includes report generation and client-specific EDD generation and validation programs.
EMAX-IS04	Software Maintenance This procedure describes guidelines for software modification and software revision. This SOP applies to program maintenance tasks, maintenance responsibility, and maintenance conventions required for overall software maintenance.

SOP No.	Title & Summary
EMAX-IS05	EDD Generation and Validation This procedure shall be performed to ensure that the EDD conforms to the required format specification and the content is accurate and complete. It covers all areas of EDD generation and validation and includes procedures for assembly, submittal, and tracking of EDDs.
EMAX-IS06	Historical File Maintenance This procedure establishes the guidelines for maintaining software files and software documentation.
EMAX-IS07	Acquisition of Software Packages This procedure describes the guidelines of the purchase or licensing of a software package.
EMAX-IS08	Data Security This procedure describes the minimum-security measures to protect laboratory programs and data.
EMAX-IS09	Backing Up Files This procedure describes the process of backing up files from a file server, fixed disk or floppy disk to a backup medium.
EMAX-IS10	Virus Protection This procedure describes the controls to protect data from invasive programs.
EMAX-IS11	Project Support Files This procedure describes the process of creating the project support files required to generate Form 1 and Form 3 reports, and electronic data deliverables. It also describes the format and structure of these files.

10.7 AUTHORIZING DEPARTURE/DEVIATION FROM SOPS

The standard operating procedures (SOP) are established to generate uniformity in complying with policies and standards. However, unusual or extraordinary circumstances may necessitate a departure or deviation from an established SOP. EMAX handles such circumstances on a case-by-case basis, with special attention given to the possible impact on the quality of data.

Departures from and deviations to SOP that are due to project specific requirements (PSR) are handled by the project management system. Other departures and deviations are classified as minor or major changes. When a departure and/or deviation from SOP will have no impact on data quality, the change is deemed to be a minor change requiring approval of either the immediate supervisor or the Laboratory Technical Director. Any departure and/or deviation from SOP that may impact the quality of data is deemed a major change and requires the approval of both the Laboratory Director and the QA Manager. When granting such approval, the Laboratory Director and the QA Manager shall consider whether the justifying circumstances are of such significance that an addendum to the SOP, a revision of the SOP or a new SOP is needed.

11.0 SAMPLE HANDLING

11.1 SAMPLE TRACKING

Sample Management (EMAX-SM01) describes EMAX's sample management, its internal control and work order distribution. It also ensures that samples and extracts under EMAX's custody shall be traceable at all times. Sample management maintains that the internal sample custody stands legally defensible by documenting the history of a sample, assuring that it has always been under the custody of an authorized individual, and that no sample is accidentally or purposely tampered.

Analytical & QC Labeling (EMAX-SM04) describes the convention of identifying extracts, digestates, QC samples, and calibration standards. This SOP also describes how each sub-sample is uniquely identified.

11.2 SAMPLE ACCEPTANCE POLICY

Samples received at EMAX are inspected thoroughly to ensure that the samples are intended for EMAX, appropriate safety precautions are observed and sample receiving procedure is implemented.

All personnel working in the sample receiving area must wear laboratory coats, gloves and safety glasses during the entire process of sample receiving.

Samples identified as pure products, known to have high contaminant levels, or coming from superfund sites are treated with extra caution due to the probability may contain hazardous substances.

Samples coming from identified radioactive sites are received in accordance to EMAX-RS02 – Receiving Radioactive Materials. These samples are expected to have < 0.5 mrem/ hr or 500 micro rem / hr and a frisk <66 dpm/100 cm^2 alpha and <1000 dpm/100 cm^2 beta. (49 CFR 173.421). Samples bearing radiation labels or which are determined upon arrival to have exceeded the acceptance limit shall be refused sample acceptance.

11.3 SAMPLE RECEIPT PROTOCOL

Sample receipt protocol is detailed in EMAX-SM02. The purpose of this SOP is to describe sample acceptance policy, sample receiving and sample storage procedures. Any sample received by EMAX Laboratories Inc. is processed as described by this procedure to ensure that inspection is thorough, the documentation is complete and the chain of custody is maintained.

11.4 SAMPLE RECEIVING DISCREPANCIES

Discrepancies found during sample receiving are documented in the Sample Receipt Form (SRF). This form is forwarded to the PM upon completion. The PM will find resolution to the discrepancy and will return the corrective action to Sample Management on a timely manner.

11.5 SAMPLE STORAGE CONDITIONS

Samples are stored at a controlled environment. Samples are only accessed in the presence of the Sample Custodian or his/her designee. Access to sample(s) is recorded in an Internal-Chain-of-Custody logbook.

Samples requiring refrigeration at 4 °C (± 2°C) are kept in refrigerators that are monitored on a daily basis using calibrated thermometers and their temperature readings are documented on a temperature log. Samples are stored for a period that the project requires.

11.6 SAMPLE DISPOSAL

Sample disposal is detailed in EMAX-SM03. The purpose of this SOP is to establish waste disposal policies in accordance with all applicable Local, State and Federal requirements and to describe the specific steps required to assure compliance to the requirements for disposing laboratory generated waste. All wastes shall be disposed in accordance with all applicable Local, State and Federal requirements. All wastes shall be separated according to different waste streams as described in this SOP.

12.0 RECORDS

12.1 RECORD-KEEPING SYSTEM AND DESIGN

12.1.1 DOCUMENT CONTROL SYSTEM

EMAX shall maintain a record system to suit its particular circumstances and comply with any applicable regulations. The system shall produce unequivocal, accurate records, which document all laboratory activities. EMAX shall retain all original observations, calculations and derived data, calibration records and a copy of the test report for at least five years.

EMAX shall maintain a record system which ensures that all standard operating procedures, test method manuals, or documents clearly indicate the period during which the procedure or document was in force.

12.2 RECORD KEEPING SYSTEM

All laboratory activities shall be recorded to allow historical reconstruction of how the resultant sample analytical data was produced. Laboratory logbooks and forms shall be used where appropriate. Laboratory logbooks or forms related to the laboratory activity are integrated with the test manual or SOP. The forms shall be designed to reflect the following:

- The records shall include the identity of personnel involved in sampling, preparation, calibration or testing.
- All information relating to the laboratory facilities, equipment, analytical test methods, and related laboratory activities (such as sample receipt, sample preparation, or data verification) shall be documented.
- The record keeping system shall facilitate the retrieval of all working files and archived records for inspection and verification purposes.
- All documentation entries shall be signed or initialed by responsible staff. The reason for the signature or initials shall be clearly indicated in the records, such as "sampled by", "prepared by", or "reviewed by".
- All generated data, except those that are generated by automated data collection systems, shall be recorded directly, promptly and legibly in permanent ink.
- Entries in records shall not be obliterated by methods such as erasures, overwritten files or markings. All corrections to record-keeping errors shall be made by one line marked through the error. The individual making the correction shall sign (or initial) and date the correction. These criteria also shall apply to electronically maintained records.
- Refer to 10.5 for Computer and Electronic Data.

12.3 RECORD MANAGEMENT & STORAGE

All records (including those pertaining to calibration and test equipment), certificates and reports shall be safely stored, held secure and in confidence to the client, and available to the accrediting authority for review.

All records shall be retained for a minimum of five years from last use. Records that are stored only on electronic media shall be supported by the hardware and software necessary for their retrieval.

Records that are stored or generated by computers or personal computers shall have hard copy or write-protected backup copies.

Logbooks are generated and controlled by the QA Department. They shall be uniquely identified, paginated and sealed. The QA Department shall maintain a ledger when the logbook was issued and archived.

EMAX shall retain a copy of all data packages that it sent to the client as well as other pertinent records obtained during the generation of data. These packages shall be archived as described in EMAX-MD02. They shall be arranged in a chronological order following the EMAX Control Numbering System (ECN). Access to archived information shall be documented with an access log. These records shall be protected against fire, theft, loss, environmental deterioration, vermin and, in the case of electronic records, electronic or magnetic sources.

All records are maintained or transferred according to the clients' instructions in the event that EMAX transfers ownership or goes out of business.

12.4 LABORATORY SAMPLE TRACKING

12.4.1 SAMPLE HANDLING

A record of all procedures to which a sample is subjected while in the possession at EMAX shall be maintained and shall be recorded as follows:

- Lot numbers of sample containers and preservations shall be recorded in the sampling supplies request form and shall be maintained by the Sample Management Department.
- Sample Receipt Form shall be filled for every SDG received and shall be used to record the condition of samples as received as well as acceptance/rejection and discrepancies/resolutions for samples received.
- Samples shall be logged electronically and the login review sheet shall be reviewed, initialed and dated by the respective PMs.
- Chain of Custody and login review sheets shall be attached to the SDG master folder and shall be archived with the data package.
- The Sample Management Department shall maintain at least the latest six months of storage and tracking records, including shipping receipts, transmittal forms, and internal routing. Older records are transferred to the Data Storage Room for archiving.
- Sample preparations (including cleanup and preparation protocols, ID codes, volumes, weights, instrument printouts, meter readings, calculations, and reagents) shall be recorded in laboratory logbooks. The Sample Preparation Department shall maintain at least the latest 12-month Logbooks. Older records are returned to the QA Department for archival.
- Sample analysis sequence shall be recorded in laboratory analysis logbook referencing the calibrations, standards, instrument used, date of analysis and initials of personnel that performed the work. The Analytical Departments shall maintain at least the latest 12-month analytical logbooks. Older records are returned to the QA Department for archival. Sample analysis documentation (including calibrations, raw data and copies of analytical log) shall be attached to every work order and archived with the final data package.

- Analytical standards, receipt, preparation and expiration shall be recorded in Standards Log. Certificate of analysis shall bear the standard ID and shall be traceable to the Standards Log. The respective Analytical Departments shall maintain standards certificate of analysis. The Analytical Departments shall maintain at least the latest 12-month standards logbooks. Older records are returned to the QA Department for archival.
- The QA Department shall maintain a record of all major analytical equipment. to include receipt, use, specification and date put to service. The QA Department shall provide unique identification for each instrument and shall be traceable to each instrument. Each instrument shall have an instrument maintenance log where operating conditions are logged on its daily use. The Analytical Departments shall maintain at least the latest 12-month instrument maintenance logbooks. Older records are returned to the QA Department for archival.
- Calibration criteria, frequency and acceptance criteria shall be attached in every work order. In the absence of these criteria, EMAX quality control procedures (QCP) shall be applied.
- Reviews shall be based on applicable criteria, including data and statistical calculations, review, confirmation, interpretation, assessment and reporting conventions. Performed reviews shall be initialed and dated by the reviewers in the attached QCP. All work orders are archived with the data package.
- The QA Department shall maintain Method performance criteria, including expected quality control requirements.
- The QA Department shall perform and maintain Quality control protocols and assessment.
- The Information Systems Department shall maintain electronic data security, software documentation and verification, software and hardware audits, backups, and records of any changes to automated data entries.
- A record of all activities in all automated sample-handling systems shall entered in a logbook. All entries shall be initialed and dated by the personnel performing the work.
- EMAX shall follow the documented procedures for the receipt, retention or safe disposal of calibration or test items, including all provisions necessary to protect the integrity of the laboratory.

12.4.2 LABORATORY SUPPORT ACTIVITIES

In addition to documenting all the above-mentioned activities, EMAX shall retain the following:

- All original raw data, whether hard copy or electronic, for calibrations, samples and quality control measures, including analysts work sheets and data output records (chromatograms, strip charts, and other instrument response readout records) with the data package archived.
- All analytical activities shall be traceable to the specific test method applied so that specific computational steps used to translate parametric observations into a reportable analytical value can be traced to the written description or reference to the specific test method used.
- Copies of final reports shall be archived in accordance to EMAX-DM02.
- Standard Operating Procedures shall be archived in accordance to EMAX-QA00.
- The PMs shall maintain records of correspondence relating to laboratory activities for a specific project.
- The QA Department shall maintain all corrective action reports, audits and audit responses
- The QA Department shall maintain Proficiency test results and raw data

- All data review and cross checking shall be initialed and dated concurrent to the laboratory activity in the appropriate document (e.g., review form, logbooks, etc.).

12.4.3 ANALYTICAL RECORDS

At a minimum, all analytical records shall be traceable to the following:

- Laboratory sample ID
- Date and time of analysis
- Instrumentation identification and instrument operating conditions/parameters (or reference to such data);

12.4.4 ADMINISTRATIVE RECORDS

The QA Department shall maintain the following:

- Personnel qualifications, experience and training records;
- Records of demonstration of capability for each analyst; and
- A log of names, initials and signatures for all individuals who are responsible for signing or initialing any laboratory record.

12.4.5 LEGAL/EVIDENTIARY CUSTODY

EMAX shall follow EMAX-SM01 in maintaining the chain-of-custody for all samples received. COCs shall be duly signed and dated by the recipients. Copies of the COCs shall be attached to the master folder and archived with the data package.

Documentation requirements regarding chain-of-custody (from the time sample(s) are received to the time samples are disposed) are detailed in EMAX-SM01. This SOP shall include, but not be limited to, the following:

- Basic Requirements
- Required Information in Custody Records
- Controlled Access to Samples
- Transfer of Samples to Another Party
- Sample Disposal

13.0 LABORATORY REPORT FORMAT AND CONTENTS

EMAX shall report all sample results as described in EMAX-DM03. Results of each test shall be reported accurately, clearly, unambiguously and objectively.

13.1 DATA PACKAGE

Data packages shall consist of the following:

- Cover Letter
- Sample Receiving Documents
- Case Narrative
- Sample Results
- Quality Control Results
- Others

13.1.1 COVER LETTER

The cover letter shall be printed on EMAX letterhead and shall include the client information (i.e., name and address of client, attention line), date of report, client sample ID cross-referenced to EMAX sample ID and analyses required.

The cover letter shall also include the attestation statement and the signature of the Technical Director. Attestation statement shall be limited to the effect that the results relate only to the items tested as received by the laboratory and that the report shall not be reproduced except in full, without the written approval of the laboratory.

Upon NELAC approval, the attestation statement shall certify that the test results meet all requirements of NELAC Standard unless otherwise specified by the project.

13.1.2 SAMPLE RECEIVING DOCUMENTS

Sample receiving documents shall include the received COC, a copy of the air bill (if any), the SRF, and any other related documents that completed the acceptance of the sample delivery.

13.1.3 CASE NARRATIVE

Case narrative shall be written for each test method performed. It shall include the number of samples for each matrix and the sample receipt date. It shall discuss the holding time, calibrations, MB(s), LCS, MS/MSD or MS/MD, surrogates (where applicable) and sample results. Anomalies encountered during process shall be discussed in the case narrative.

13.1.4 LABORATORY RESULTS

Laboratory results shall be preceded by a case narrative reported in EMAX Form 1 for each test method. Laboratory results, at a minimum, include the following:

- Title – consisting of two lines: first line shall read "Sample Results" and the second line shall read the test method name.

- Header consisting of the name of the project, client sample ID, EMAX sample ID, data filename, preparation and analytical batch reference, calibration reference, date received, date prepared, date analyzed, matrix and percent moisture(where applicable).

- Sample result consisting of the analytes of interest, result(s), reporting limit(s), method detection limits and units. Where surrogates are added, the recovery of each surrogate shall be added to the Form 1 below the analytes of interest and shall be indicated as "Surrogate(s)". Sample results shall be qualified as specified by the project. Numerical results with values exceeding quantitation levels shall be flagged by "E".

- When required by the project, the PMs shall notify clients promptly, in writing, of any circumstance where sample result(s) casts doubt on the validity of the test (e.g. holding time, calibration, control limits, etc.).

Each page following the cover letter of the data package shall be uniquely paginated. Laboratory results from subcontractors shall have clear identification of all test data provided.

EMAX shall retain a copy of the entire data package, which copy shall remain unchanged.

13.2 AMENDMENTS TO LABORATORY RESULTS

After issuance of the data package, the archived copy shall remain unchanged. Amendments to any part of the data package shall be stamped with "REVISED REPORT for [SDG]" and shall also be uniquely paginated.

13.3 DATA PACKAGE TRANSMITTAL

Data package transmittal shall adhere to the project requirement. Where clients require transmission of test results by telephone, telex, facsimile or other electronic or electromagnetic means, staff will follow documented procedures and ensure that confidentiality is preserved.

14.0 SUBCONTRACTING ANALYTICAL SAMPLES

Subcontracting analytical samples shall be executed in accordance to EMAX-QA02. Where NELAP accreditation is required, the subcontractor shall include in its attestation statement that all results are performed under NELAP Standards.

15.0 OUTSIDE SUPPORT SERVICES AND SUPPLIES

EMAX shall use only those outside support services and supplies that are of adequate quality to sustain confidence in the laboratory's tests.

Where no independent assurance of the quality of outside support services or supplies is available (e.g., reagent water purchased commercially), EMAX shall analyze and certify the purity of the reagent water.

EMAX shall, wherever possible, ensure that purchased equipment and consumable materials are not used until they have been inspected, calibrated or otherwise verified as complying with any standard specifications relevant to the calibrations or tests concerned

All purchases for the laboratory shall adhere to EMAX-QA09. The tables in EMAX-QA09 shall list of all suppliers from whom it obtains support services or supplies required for tests.

16.0 COMPLAINTS

In the event that a complaint or any other circumstance raises doubt concerning EMAX's compliance to documented policies or procedures, root cause analysis shall be applied and resolution(s) should include appropriate corrective action, assessment to data impact and measures to prevent recurrence. Responsible parties should be involved in the fact-finding process as well as in the implementation of corrective action and prevention from recurrence.

Complaints shall be acted on and resolved in accordance to EMAX-QA08.

PRINT DRF

STATE OF CALIFORNIA
DEPARTMENT OF HEALTH SERVICES

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM
NELAP - RECOGNIZED

ACCREDITATION

Is hereby granted to

EMAX LABORATORIES, INC.

1835 WEST 205th STREET

TORRANCE, CA 90501

Scope of accreditation is limited to the
"NELAP Fields of Accreditation"
which accompanies this Certificate.

Continued accredited status depends on successful
ongoing participation in the program.

This Certificate is granted in accordance with provisions of
Section 100825, et seq. of the Health and Safety Code.

Certificate No:	**02116CA**
Expiration Date:	**08/31/2005**
Effective Date:	**08/31/2004**

Berkeley, California
subject to forfeiture or revocation.

George C. Kulasingam

George C. Kulasingam, Ph.D.
Program Chief
Environmental Laboratory Accreditation Program

CALIFORNIA DEPARTMENT OF HEALTH SERVICES
ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM - NELAP RECOGNIZED
Fields of Accreditation

EMAX LABORATORIES, INC. **Lab Phone** (310) 618-8889

1835 WEST 205th STREET
TORRANCE, CA 90501

Certificate No: 02116CA **Renew Date: 08/31/2005** **INTERIM**

102 - Inorganic Chemistry of Drinking Water

102.020	001	EPA 180.1	Turbidity
102.022	001	SM2130B	Turbidity
102.030	001	EPA 300.0	Bromide
102.030	002	EPA 300.0	Chlorate
102.030	003	EPA 300.0	Chloride
102.030	005	EPA 300.0	Fluoride
102.030	006	EPA 300.0	Nitrate
102.030	007	EPA 300.0	Nitrite
102.030	008	EPA 300.0	Phosphate, Ortho
102.030	009	EPA 300.0	Perchlorate
102.030	010	EPA 300.0	Sulfate
102.040	004	EPA 300.1	Bromate
102.045	001	EPA 314.0	Perchlorate
102.070	001	EPA 365.1	Phosphate, Ortho
102.090	001	EPA 415.1	Total Organic Carbon
102.100	001	SM2320B	Alkalinity
102.120	001	SM2340B	Hardness
102.121	001	SM2340C	Hardness
102.130	001	SM2510B	Conductivity
102.130	001	SM2510B	Conductivity
102.140	001	SM2540C	Total Dissolved Solids
102.145	001	EPA 160.1	Total Dissolved Solids
102.150	001	SM4110B	Chloride
102.150	002	SM4110B	Fluoride
102.150	003	SM4110B	Nitrate
102.150	004	SM4110B	Nitrite
102.200	001	SM4500-F C	Fluoride
102.210	001	SM4500-H+ B	pH
102.212	001	EPA 150.1	pH
102.260	001	SM5310B	Total Organic Carbon
102.270	001	SM5540C	Surfactants

103 - Toxic Chemical Elements of Drinking Water

103.130	001	EPA 200.7	Aluminum
103.130	002	EPA 200.7	Arsenic
103.130	003	EPA 200.7	Barium
103.130	004	EPA 200.7	Beryllium
103.130	005	EPA 200.7	Cadmium
103.130	007	EPA 200.7	Chromium
103.130	008	EPA 200.7	Copper

As of 09/27/2004, this list supersedes all previous lists for this certificate number.
Customers: Please verify the current accreditation standing with the State.

103.130	009	EPA 200.7	Iron
103.130	011	EPA 200.7	Manganese
103.130	012	EPA 200.7	Nickel
103.130	015	EPA 200.7	Silver
103.130	017	EPA 200.7	Zinc
103.140	001	EPA 200.8	Aluminum
103.140	002	EPA 200.8	Antimony
103.140	003	EPA 200.8	Arsenic
103.140	004	EPA 200.8	Barium
103.140	005	EPA 200.8	Beryllium
103.140	006	EPA 200.8	Cadmium
103.140	007	EPA 200.8	Chromium
103.140	008	EPA 200.8	Copper
103.140	009	EPA 200.8	Lead
103.140	010	EPA 200.8	Manganese
103.140	011	EPA 200.8	Mercury
103.140	012	EPA 200.8	Nickel
103.140	013	EPA 200.8	Selenium
103.140	014	EPA 200.8	Silver
103.140	015	EPA 200.8	Thallium
103.140	016	EPA 200.8	Zinc
103.310	001	EPA 218.6	Chromium (VI)
104 - Volatile Organic Chemistry of Drinking Water			
104.030	001	EPA 504.1	1,2-Dibromoethane
104.030	002	EPA 504.1	1,2-Dibromo-3-chloropropane
104.040	001	EPA 524.2	Benzene
104.040	002	EPA 524.2	Bromobenzene
104.040	003	EPA 524.2	Bromochloromethane
104.040	004	EPA 524.2	Bromodichloromethane
104.040	005	EPA 524.2	Bromoform
104.040	006	EPA 524.2	Bromomethane
104.040	007	EPA 524.2	n-Butylbenzene
104.040	008	EPA 524.2	sec-Butylbenzene
104.040	009	EPA 524.2	tert-Butylbenzene
104.040	010	EPA 524.2	Carbon Tetrachloride
104.040	011	EPA 524.2	Chlorobenzene
104.040	012	EPA 524.2	Chloroethane
104.040	013	EPA 524.2	Chloroform
104.040	014	EPA 524.2	Chloromethane
104.040	015	EPA 524.2	2-Chlorotoluene
104.040	016	EPA 524.2	4-Chlorotoluene
104.040	017	EPA 524.2	Dibromochloromethane
104.040	018	EPA 524.2	Dibromomethane
104.040	019	EPA 524.2	1,3-Dichlorobenzene
104.040	020	EPA 524.2	1,2-Dichlorobenzene
104.040	021	EPA 524.2	1,4-Dichlorobenzene
104.040	022	EPA 524.2	Dichlorodifluoromethane
104.040	023	EPA 524.2	1,1-Dichloroethane

104.040	024	EPA 524.2	1,2-Dichloroethane
104.040	025	EPA 524.2	1,1-Dichloroethene
104.040	026	EPA 524.2	cis-1,2-Dichloroethene
104.040	027	EPA 524.2	trans-1,2-Dichloroethene
104.040	028	EPA 524.2	Dichloromethane
104.040	029	EPA 524.2	1,2-Dichloropropane
104.040	030	EPA 524.2	1,3-Dichloropropane
104.040	031	EPA 524.2	2,2-Dichloropropane
104.040	032	EPA 524.2	1,1-Dichloropropene
104.040	033	EPA 524.2	cis-1,3-Dichloropropene
104.040	034	EPA 524.2	trans-1,3-Dichloropropene
104.040	035	EPA 524.2	Ethylbenzene
104.040	036	EPA 524.2	Hexachlorobutadiene
104.040	037	EPA 524.2	Isopropylbenzene
104.040	038	EPA 524.2	4-Isopropyltoluene
104.040	039	EPA 524.2	Naphthalene
104.040	040	EPA 524.2	Nitrobenzene
104.040	041	EPA 524.2	N-propylbenzene
104.040	042	EPA 524.2	Styrene
104.040	043	EPA 524.2	1,1,1,2-Tetrachloroethane
104.040	044	EPA 524.2	1,1,2,2-Tetrachloroethane
104.040	045	EPA 524.2	Tetrachloroethene
104.040	046	EPA 524.2	Toluene
104.040	047	EPA 524.2	1,2,3-Trichlorobenzene
104.040	048	EPA 524.2	1,2,4-Trichlorobenzene
104.040	049	EPA 524.2	1,1,1-Trichloroethane
104.040	050	EPA 524.2	1,1,2-Trichloroethane
104.040	051	EPA 524.2	Trichloroethene
104.040	052	EPA 524.2	Trichlorofluoromethane
104.040	053	EPA 524.2	1,2,3-Trichloropropane
104.040	054	EPA 524.2	1,2,4-Trimethylbenzene
104.040	055	EPA 524.2	1,3,5-Trimethylbenzene
104.040	056	EPA 524.2	Vinyl Chloride
104.040	057	EPA 524.2	Xylenes, Total
104.045	001	EPA 524.2	Bromodichloromethane
104.045	002	EPA 524.2	Bromoform
104.045	003	EPA 524.2	Chloroform
104.045	004	EPA 524.2	Dibromochloromethane
104.050	001	EPA 524.2	Trihalomethanes, Total
104.050	002	EPA 524.2	Methyl tert-butyl Ether (MTBE)
104.050	003	EPA 524.2	Di-isopropyl Ether (DIPE)
104.050	004	EPA 524.2	tert-Amyl Methyl Ether (TAME)
104.050	005	EPA 524.2	Ethyl tert-butyl Ether (ETBE)
104.050	006	EPA 524.2	Trichlorotrifluoroethane
104.050	008	EPA 524.2	Carbon Disulfide
104.050	009	EPA 524.2	Methyl Isobutyl Ketone

108 - Inorganic Chemistry of Wastewater

108.016	001	EPA 110.2	Color

108.020	001	EPA 120.1	Conductivity
108.030	001	EPA 130.1	Hardness
108.040	001	EPA 130.2	Hardness
108.050	001	EPA 150.1	pH
108.060	001	EPA 160.1	Residue, Filterable
108.070	001	EPA 160.2	Residue, Non-filterable
108.080	001	EPA 160.3	Residue, Total
108.110	001	EPA 180.1	Turbidity
108.112	001	EPA 200.7	Boron
108.112	002	EPA 200.7	Calcium
108.112	004	EPA 200.7	Magnesium
108.112	005	EPA 200.7	Potassium
108.112	006	EPA 200.7	Silica
108.112	007	EPA 200.7	Sodium
108.120	001	EPA 300.0	Bromide
108.120	002	EPA 300.0	Chloride
108.120	003	EPA 300.0	Fluoride
108.120	004	EPA 300.0	Nitrate
108.120	005	EPA 300.0	Nitrite
108.120	006	EPA 300.0	Nitrate-nitrite, Total
108.120	007	EPA 300.0	Phosphate, Ortho
108.120	008	EPA 300.0	Sulfate
108.130	001	EPA 305.1	Acidity
108.140	001	EPA 310.1	Alkalinity
108.172	001	EPA 330.3	Chlorine Residual, Total
108.180	001	EPA 335.1	Cyanide, amenable
108.181	001	EPA 335.2	Cyanide, Total
108.191	001	EPA 340.2	Fluoride
108.201	001	EPA 350.2	Ammonia
108.212	001	EPA 351.3	Kjeldahl Nitrogen
108.262	001	EPA 365.2	Phosphate, Ortho
108.263	001	EPA 365.2	Phosphorus, Total
108.270	001	EPA 370.1	Dissolved Silica
108.290	001	EPA 376.1	Sulfide
108.291	001	EPA 376.2	Sulfide
108.300	001	EPA 377.1	Sulfite
108.310	001	EPA 405.1	Biochemical Oxygen Demand
108.323	001	EPA 410.4	Chemical Oxygen Demand
108.330	001	EPA 413.1	Oil and Grease
108.340	001	EPA 415.1	Total Organic Carbon
108.350	001	EPA 418.1	Total Recoverable Petroleum Hydrocarbons
108.360	001	EPA 420.1	Phenols, Total
108.370	001	EPA 425.1	Surfactants
108.380	001	EPA 1664	Oil and Grease
108.390	001	SM2130B	Turbidity
108.400	001	SM2310B	Acidity
108.410	001	SM2320B	Alkalinity
108.420	001	SM2340B	Hardness (calc.)

108.421	001	SM2340C	Hardness
108.430	001	SM2510B	Conductivity
108.440	001	SM2540B	Residue, Total
108.441	001	SM2540C	Residue, Filterable
108.442	001	SM2540D	Residue, Non-filterable
108.443	001	SM2540F	Residue, Settleable
108.480	001	SM4500-F C	Fluoride
108.490	001	SM4500-H+ B	pH
108.590	001	SM5210B	Biochemical Oxygen Demand
108.610	001	SM5310B	Total Organic Carbon
108.630	001	SM5520B	Oil and Grease
109 - Toxic Chemical Elements of Wastewater			
109.104	001	EPA 218.6	Chromium (VI)
110 - Volatile Organic Chemistry of Wastewater			
110.040	001	EPA 624	Benzene
110.040	002	EPA 624	Bromodichloromethane
110.040	003	EPA 624	Bromoform
110.040	004	EPA 624	Bromomethane
110.040	005	EPA 624	Carbon Tetrachloride
110.040	006	EPA 624	Chlorobenzene
110.040	007	EPA 624	Chloroethane
110.040	008	EPA 624	2-Chloroethyl Vinyl Ether
110.040	009	EPA 624	Chloroform
110.040	010	EPA 624	Chloromethane
110.040	011	EPA 624	Dibromochloromethane
110.040	012	EPA 624	1,2-Dichlorobenzene
110.040	013	EPA 624	1,3-Dichlorobenzene
110.040	014	EPA 624	1,4-Dichlorobenzene
110.040	015	EPA 624	1,1-Dichloroethane
110.040	016	EPA 624	1,2-Dichloroethane
110.040	017	EPA 624	1,1-Dichloroethene
110.040	018	EPA 624	trans-1,2-Dichloroethene
110.040	019	EPA 624	1,2-Dichloropropane
110.040	020	EPA 624	cis-1,3-Dichloropropene
110.040	021	EPA 624	trans-1,3-Dichloropropene
110.040	022	EPA 624	Ethylbenzene
110.040	023	EPA 624	Methylene Chloride
110.040	024	EPA 624	1,1,2,2-Tetrachloroethane
110.040	025	EPA 624	Tetrachloroethene
110.040	026	EPA 624	Toluene
110.040	027	EPA 624	1,1,1-Trichloroethane
110.040	028	EPA 624	1,1,2-Trichloroethane
110.040	029	EPA 624	Trichloroethene
110.040	030	EPA 624	Trichlorofluoromethane
110.040	031	EPA 624	Vinyl Chloride
114 - Inorganic Chemistry of Hazardous Waste			
114.010	001	EPA 6010B	Antimony

114.010	002	EPA 6010B	Arsenic
114.010	003	EPA 6010B	Barium
114.010	004	EPA 6010B	Beryllium
114.010	005	EPA 6010B	Cadmium
114.010	006	EPA 6010B	Chromium
114.010	007	EPA 6010B	Cobalt
114.010	008	EPA 6010B	Copper
114.010	009	EPA 6010B	Lead
114.010	010	EPA 6010B	Molybdenum
114.010	011	EPA 6010B	Nickel
114.010	012	EPA 6010B	Selenium
114.010	013	EPA 6010B	Silver
114.010	014	EPA 6010B	Thallium
114.010	015	EPA 6010B	Vanadium
114.010	016	EPA 6010B	Zinc
114.020	001	EPA 6020	Antimony
114.020	002	EPA 6020	Arsenic
114.020	003	EPA 6020	Barium
114.020	004	EPA 6020	Beryllium
114.020	005	EPA 6020	Cadmium
114.020	006	EPA 6020	Chromium
114.020	007	EPA 6020	Cobalt
114.020	008	EPA 6020	Copper
114.020	009	EPA 6020	Lead
114.020	010	EPA 6020	Molybdenum
114.020	011	EPA 6020	Nickel
114.020	012	EPA 6020	Selenium
114.020	013	EPA 6020	Silver
114.020	014	EPA 6020	Thallium
114.020	015	EPA 6020	Vanadium
114.020	016	EPA 6020	Zinc
114.031	001	EPA 7041	Antimony
114.040	001	EPA 7060A	Arsenic
114.081	001	EPA 7131A	Cadmium
114.103	001	EPA 7196A	Chromium (VI)
114.106	001	EPA 7199	Chromium (VI)
114.121	001	EPA 7211	Copper
114.131	001	EPA 7421	Lead
114.140	001	EPA 7470A	Mercury
114.141	001	EPA 7471A	Mercury
114.170	001	EPA 7740	Selenium
114.181	001	EPA 7761	Silver
114.191	001	EPA 7841	Thallium
114.220	001	EPA 9010	Cyanide, Total
114.222	001	EPA 9014	Cyanide
114.230	001	EPA 9034	Sulfides, Total
114.240	001	EPA 9040	pH
114.241	001	EPA 9045	pH

114.250	001	EPA 9056	Fluoride
114.285	001	EPA 300.0	Fluoride
115 - Extraction Test of Hazardous Waste			
115.020	001	EPA 1311	Toxicity Characteristic Leaching Procedure (TCLP)
115.030	001	CCR Chapter11, Article 5, Appendix II	Waste Extraction Test (WET)
115.040	001	EPA 1312	Synthetic Precipitation Leaching Procedure (SPLP)
116 - Volatile Organic Chemistry of Hazardous Waste			
116.010	001	EPA 8011	1,2-Dibromoethane
116.010	002	EPA 8011	Dibromochloropropane
116.020	011	EPA 8015B	Ethylene Glycol
116.030	001	EPA 8015B	Gasoline-range Organics
116.040	002	EPA 8021B	Benzene
116.040	039	EPA 8021B	Ethylbenzene
116.040	041	EPA 8021B	Methyl tert-butyl Ether (MTBE)
116.040	047	EPA 8021B	Toluene
116.040	056	EPA 8021B	Xylenes, Total
116.080	001	EPA 8260B	Acetone
116.080	002	EPA 8260B	Acetonitrile
116.080	003	EPA 8260B	Acrolein
116.080	004	EPA 8260B	Acrylonitrile
116.080	006	EPA 8260B	Allyl Chloride
116.080	007	EPA 8260B	Benzene
116.080	009	EPA 8260B	Bromoacetone
116.080	010	EPA 8260B	Bromochloromethane
116.080	011	EPA 8260B	Bromodichloromethane
116.080	012	EPA 8260B	Bromoform
116.080	013	EPA 8260B	Bromomethane
116.080	014	EPA 8260B	n-Butyl Alcohol
116.080	015	EPA 8260B	Carbon Disulfide
116.080	016	EPA 8260B	Carbon Tetrachloride
116.080	018	EPA 8260B	Chlorobenzene
116.080	019	EPA 8260B	Chloroethane
116.080	020	EPA 8260B	2-Chloroethyl Vinyl Ether
116.080	021	EPA 8260B	Chloroform
116.080	022	EPA 8260B	Chloromethane
116.080	023	EPA 8260B	Chloroprene
116.080	026	EPA 8260B	Dibromochloromethane
116.080	027	EPA 8260B	Dibromochloropropane
116.080	028	EPA 8260B	1,2-Dibromoethane
116.080	030	EPA 8260B	Dibromomethane
116.080	031	EPA 8260B	1,2-Dichlorobenzene
116.080	032	EPA 8260B	1,3-Dichlorobenzene
116.080	033	EPA 8260B	1,4-Dichlorobenzene
116.080	034	EPA 8260B	cis-1,4-Dichloro-2-butene
116.080	035	EPA 8260B	trans-1,4-Dichloro-2-butene
116.080	036	EPA 8260B	Dichlorodifluoromethane
116.080	037	EPA 8260B	1,1-Dichloroethane
116.080	038	EPA 8260B	1,2-Dichloroethane

116.080	039	EPA 8260B	1,1-Dichloroethene
116.080	040	EPA 8260B	trans-1,2-Dichloroethene
116.080	041	EPA 8260B	cis-1,2-Dichloroethene
116.080	042	EPA 8260B	1,2-Dichloropropane
116.080	043	EPA 8260B	1,3-Dichloropropane
116.080	044	EPA 8260B	2,2-Dichloropropane
116.080	045	EPA 8260B	1,1-Dichloropropene
116.080	046	EPA 8260B	cis-1,3-Dichloropropene
116.080	047	EPA 8260B	trans-1,3-Dichloropropene
116.080	050	EPA 8260B	1,4-Dioxane
116.080	053	EPA 8260B	Ethylbenzene
116.080	055	EPA 8260B	Ethyl Methacrylate
116.080	056	EPA 8260B	Hexachlorobutadiene
116.080	058	EPA 8260B	2-Hexanone (MBK)
116.080	059	EPA 8260B	Iodomethane
116.080	060	EPA 8260B	Isobutyl Alcohol
116.080	062	EPA 8260B	Methacrylonitrile
116.080	064	EPA 8260B	Methyl tert-butyl Ether (MTBE)
116.080	065	EPA 8260B	Methylene Chloride
116.080	066	EPA 8260B	Methyl Ethyl Ketone
116.080	067	EPA 8260B	Methyl Methacrylate
116.080	068	EPA 8260B	4-Methyl-2-pentanone (MIBK)
116.080	069	EPA 8260B	Naphthalene
116.080	070	EPA 8260B	Nitrobenzene
116.080	072	EPA 8260B	N-nitrosodi-n-butylamine
116.080	074	EPA 8260B	Pentachloroethane
116.080	076	EPA 8260B	2-Picoline
116.080	078	EPA 8260B	Propionitrile
116.080	080	EPA 8260B	Pyridine
116.080	081	EPA 8260B	1,1,1,2-Tetrachloroethane
116.080	082	EPA 8260B	1,1,2,2-Tetrachloroethane
116.080	083	EPA 8260B	Tetrachloroethene
116.080	084	EPA 8260B	Toluene
116.080	086	EPA 8260B	1,2,3-Trichlorobenzene
116.080	087	EPA 8260B	1,2,4-Trichlorobenzene
116.080	088	EPA 8260B	1,1,1-Trichloroethane
116.080	089	EPA 8260B	1,1,2-Trichloroethane
116.080	090	EPA 8260B	Trichloroethene
116.080	091	EPA 8260B	Trichlorofluoromethane
116.080	092	EPA 8260B	1,2,3-Trichloropropane
116.080	093	EPA 8260B	Vinyl Acetate
116.080	094	EPA 8260B	Vinyl Chloride
116.080	095	EPA 8260B	Xylenes, Total
116.080	096	EPA 8260B	tert-Amyl Methyl Ether (TAME)
116.080	097	EPA 8260B	tert-Butyl Alcohol (TBA)
116.080	098	EPA 8260B	Ethyl tert-butyl Ether (ETBE)
116.080	099	EPA 8260B	Bromobenzene
116.080	100	EPA 8260B	n-Butylbenzene

116.080	101	EPA 8260B	sec-Butylbenzene
116.080	102	EPA 8260B	tert-Butylbenzene
116.080	103	EPA 8260B	2-Chlorotoluene
116.080	104	EPA 8260B	4-Chlorotoluene
116.080	105	EPA 8260B	Isopropylbenzene
116.080	106	EPA 8260B	N-propylbenzene
116.080	107	EPA 8260B	Styrene
116.080	108	EPA 8260B	1,2,4-Trimethylbenzene
116.080	109	EPA 8260B	1,3,5-Trimethylbenzene

117 - Semi-volatile Organic Chemistry of Hazardous Waste

117.010	001	EPA 8015B	Diesel-range Total Petroleum Hydrocarbons
117.016	001	LUFT	Diesel-range Total Petroleum Hydrocarbons
117.017	001	EPA 418.1	TRPH Screening
117.110	001	EPA 8270C	Acenaphthene
117.110	002	EPA 8270C	Acenaphthylene
117.110	003	EPA 8270C	Acetophenone
117.110	004	EPA 8270C	2-Acetylaminofluorene
117.110	006	EPA 8270C	4-Aminobiphenyl
117.110	007	EPA 8270C	Aniline
117.110	008	EPA 8270C	Anthracene
117.110	010	EPA 8270C	Benzidine
117.110	011	EPA 8270C	Benz(a)anthracene
117.110	012	EPA 8270C	Benzo(b)fluoranthene
117.110	013	EPA 8270C	Benzo(k)fluoranthene
117.110	014	EPA 8270C	Benzo(g,h,i)perylene
117.110	015	EPA 8270C	Benzo(a)pyrene
117.110	016	EPA 8270C	Benzoic Acid
117.110	018	EPA 8270C	Benzyl Alcohol
117.110	019	EPA 8270C	Benzyl Butyl Phthalate
117.110	020	EPA 8270C	Bis(2-chloroethoxy)methane
117.110	021	EPA 8270C	Bis(2-chloroethyl) Ether
117.110	022	EPA 8270C	Bis(2-chloroisopropyl) Ether
117.110	024	EPA 8270C	4-Bromophenyl Phenyl Ether
117.110	025	EPA 8270C	Carbazole
117.110	026	EPA 8270C	4-Chloroaniline
117.110	027	EPA 8270C	4-Chloro-3-methylphenol
117.110	029	EPA 8270C	2-Chloronaphthalene
117.110	030	EPA 8270C	2-Chlorophenol
117.110	031	EPA 8270C	4-Chlorophenyl Phenyl Ether
117.110	032	EPA 8270C	Chrysene
117.110	036	EPA 8270C	Dibenz(a,h)anthracene
117.110	037	EPA 8270C	Dibenzofuran
117.110	038	EPA 8270C	Dibenzo(a,e)pyrene
117.110	039	EPA 8270C	1,2-Dichlorobenzene
117.110	040	EPA 8270C	1,3-Dichlorobenzene
117.110	041	EPA 8270C	1,4-Dichlorobenzene
117.110	042	EPA 8270C	3,3'-Dichlorobenzidine
117.110	043	EPA 8270C	2,4-Dichlorophenol

117.110	044	EPA 8270C	2,6-Dichlorophenol
117.110	045	EPA 8270C	Diethyl Phthalate
117.110	050	EPA 8270C	p-Dimethylaminoazobenzene
117.110	051	EPA 8270C	7,12-Dimethylbenz(a)anthracene
117.110	052	EPA 8270C	a,a-Dimethylphenethylamine
117.110	053	EPA 8270C	2,4-Dimethylphenol
117.110	054	EPA 8270C	Dimethyl Phthalate
117.110	055	EPA 8270C	Di-n-butyl phthalate
117.110	056	EPA 8270C	Di-n-octyl phthalate
117.110	060	EPA 8270C	2,4-Dinitrophenol
117.110	061	EPA 8270C	2,4-Dinitrotoluene
117.110	062	EPA 8270C	2,6-Dinitrotoluene
117.110	064	EPA 8270C	1,2-Diphenylhydrazine
117.110	066	EPA 8270C	Ethyl Methanesulfonate
117.110	067	EPA 8270C	Fluoranthene
117.110	068	EPA 8270C	Fluorene
117.110	069	EPA 8270C	Hexachlorobenzene
117.110	070	EPA 8270C	Hexachlorobutadiene
117.110	071	EPA 8270C	Hexachlorocyclopentadiene
117.110	072	EPA 8270C	Hexachloroethane
117.110	073	EPA 8270C	Hexachlorophene
117.110	074	EPA 8270C	Hexachloropropene
117.110	075	EPA 8270C	Indeno(1,2,3-c,d)pyrene
117.110	076	EPA 8270C	Isophorone
117.110	077	EPA 8270C	Isosafrole
117.110	079	EPA 8270C	3-Methylcholanthrene
117.110	080	EPA 8270C	2-Methyl-4,6-dinitrophenol
117.110	082	EPA 8270C	Methyl Methanesulfonate
117.110	083	EPA 8270C	2-Methylnaphthalene
117.110	084	EPA 8270C	2-Methylphenol
117.110	085	EPA 8270C	3-Methylphenol
117.110	086	EPA 8270C	4-Methylphenol
117.110	087	EPA 8270C	Naphthalene
117.110	088	EPA 8270C	1,4-Naphthoquinone
117.110	089	EPA 8270C	1-Naphthylamine
117.110	090	EPA 8270C	2-Naphthylamine
117.110	092	EPA 8270C	2-Nitroaniline
117.110	093	EPA 8270C	3-Nitroaniline
117.110	094	EPA 8270C	4-Nitroaniline
117.110	095	EPA 8270C	Nitrobenzene
117.110	096	EPA 8270C	2-Nitrophenol
117.110	097	EPA 8270C	4-Nitrophenol
117.110	098	EPA 8270C	N-nitrosodi-n-butylamine
117.110	099	EPA 8270C	N-nitrosodiethylamine
117.110	100	EPA 8270C	N-nitrosodimethylamine
117.110	101	EPA 8270C	N-nitrosodi-n-propylamine
117.110	102	EPA 8270C	N-nitrosodiphenylamine
117.110	103	EPA 8270C	N-nitrosomethylethylamine

117.110	104	EPA 8270C	N-nitrosomorpholine
117.110	105	EPA 8270C	N-nitrosopiperidine
117.110	106	EPA 8270C	N-nitrosopyrrolidine
117.110	107	EPA 8270C	5-Nitro-o-toluidine
117.110	108	EPA 8270C	Pentachlorobenzene
117.110	109	EPA 8270C	Pentachloronitrobenzene
117.110	110	EPA 8270C	Pentachlorophenol
117.110	111	EPA 8270C	Phenacetin
117.110	112	EPA 8270C	Phenanthrene
117.110	113	EPA 8270C	Phenol
117.110	116	EPA 8270C	2-Picoline
117.110	119	EPA 8270C	Pyrene
117.110	120	EPA 8270C	Pyridine
117.110	122	EPA 8270C	Safrole
117.110	124	EPA 8270C	1,2,4,5-Tetrachlorobenzene
117.110	125	EPA 8270C	2,3,4,6-Tetrachlorophenol
117.110	128	EPA 8270C	o-Toluidine
117.110	129	EPA 8270C	1,2,4-Trichlorobenzene
117.110	130	EPA 8270C	2,4,5-Trichlorophenol
117.110	131	EPA 8270C	2,4,6-Trichlorophenol
117.110	132	EPA 8270C	1,3,5-Trinitrobenzene
117.110	133	EPA 8270C	Bis(2-ethylhexyl)Phthalate
117.111	025	EPA 8270C	Dimethoate
117.111	026	EPA 8270C	Dinoseb
117.111	036	EPA 8270C	Famphur
117.111	039	EPA 8270C	Isodrin
117.111	040	EPA 8270C	Kepone
117.111	054	EPA 8270C	Parathion Ethyl
117.111	055	EPA 8270C	Parathion Methyl
117.111	056	EPA 8270C	Phorate
117.111	058	EPA 8270C	Sulfotepp
117.111	061	EPA 8270C	O,O,O-triethyl Phosphorothioate
117.140	001	EPA 8310	Acenaphthene
117.140	002	EPA 8310	Acenaphthylene
117.140	003	EPA 8310	Anthracene
117.140	004	EPA 8310	Benz(a)anthracene
117.140	005	EPA 8310	Benzo(a)pyrene
117.140	006	EPA 8310	Benzo(b)fluoranthene
117.140	007	EPA 8310	Benzo(k)fluoranthene
117.140	008	EPA 8310	Benzo(g,h,i)perylene
117.140	009	EPA 8310	Chrysene
117.140	010	EPA 8310	Dibenz(a,h)anthracene
117.140	011	EPA 8310	Fluoranthene
117.140	012	EPA 8310	Fluorene
117.140	013	EPA 8310	Indeno(1,2,3-c,d)pyrene
117.140	014	EPA 8310	Naphthalene
117.140	015	EPA 8310	Phenanthrene
117.140	016	EPA 8310	Pyrene

117.170	001	EPA 8330	4-Amino-2,6-dinitrotoluene
117.170	002	EPA 8330	2-Amino-4,6-dinitrotoluene
117.170	003	EPA 8330	1,3-Dinitrobenzene
117.170	004	EPA 8330	2,4-Dinitrotoluene
117.170	005	EPA 8330	2,6-Dinitrotoluene
117.170	006	EPA 8330	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
117.170	007	EPA 8330	Methyl-2,4,6-trinitrophenylnitramine
117.170	008	EPA 8330	Nitrobenzene
117.170	009	EPA 8330	2-Nitrotoluene
117.170	010	EPA 8330	3-Nitrotoluene
117.170	011	EPA 8330	4-Nitrotoluene
117.170	012	EPA 8330	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
117.170	013	EPA 8330	1,3,5-Trinitrobenzene
117.170	014	EPA 8330	2,4,6-Trinitrotoluene
117.190	001	EPA 8332	Nitroglycerine
117.210	001	EPA 8081A	Aldrin
117.210	002	EPA 8081A	a-BHC
117.210	003	EPA 8081A	b-BHC
117.210	004	EPA 8081A	d-BHC
117.210	005	EPA 8081A	g-BHC (Lindane)
117.210	007	EPA 8081A	a-Chlordane
117.210	008	EPA 8081A	g-Chlordane
117.210	009	EPA 8081A	Chlordane (tech.)
117.210	013	EPA 8081A	4,4'-DDD
117.210	014	EPA 8081A	4,4'-DDE
117.210	015	EPA 8081A	4,4'-DDT
117.210	016	EPA 8081A	Diallate
117.210	020	EPA 8081A	Dieldrin
117.210	021	EPA 8081A	Endosulfan I
117.210	022	EPA 8081A	Endosulfan II
117.210	023	EPA 8081A	Endosulfan Sulfate
117.210	024	EPA 8081A	Endrin
117.210	025	EPA 8081A	Endrin Aldehyde
117.210	026	EPA 8081A	Endrin Ketone
117.210	027	EPA 8081A	Heptachlor
117.210	028	EPA 8081A	Heptachlor Epoxide
117.210	033	EPA 8081A	Methoxychlor
117.210	039	EPA 8081A	Toxaphene
117.220	001	EPA 8082	PCB-1016
117.220	002	EPA 8082	PCB-1221
117.220	003	EPA 8082	PCB-1232
117.220	004	EPA 8082	PCB-1242
117.220	005	EPA 8082	PCB-1248
117.220	006	EPA 8082	PCB-1254
117.220	007	EPA 8082	PCB-1260
117.220	008	EPA 8082	2-Chlorobiphenyl
117.220	009	EPA 8082	2,3-Dichlorobiphenyl
117.220	010	EPA 8082	2,2',5-Trichlorobiphenyl

117.220	011	EPA 8082	2,4',5-Trichlorobiphenyl
117.220	012	EPA 8082	2,2',3,5'-Tetrachlorobiphenyl
117.220	013	EPA 8082	2,2',5,5'-Tetrachlorobiphenyl
117.220	014	EPA 8082	2,3',4,4'-Tetrachlorobiphenyl
117.220	015	EPA 8082	2,2',3,4,5'-Pentachlorobiphenyl
117.220	016	EPA 8082	2,2',4,5,5'-Pentachlorobiphenyl
117.220	017	EPA 8082	2,3,3',4',6-Pentachlorobiphenyl
117.220	018	EPA 8082	2,2',3,4,4',5'-Hexachlorobiphenyl
117.220	019	EPA 8082	2,2',3,4,5,5'-Hexachlorobiphenyl
117.220	020	EPA 8082	2,2',3,5,5',6-Hexachlorobiphenyl
117.220	021	EPA 8082	2,2',4,4',5,5'-Hexachlorobiphenyl
117.220	022	EPA 8082	2,2',3,3',4,4',5-Heptachlorobiphenyl
117.220	023	EPA 8082	2,2',3,4,4',5,5'-Heptachlorobiphenyl
117.220	024	EPA 8082	2,2',3,4,4',5',6-Heptachlorobiphenyl
117.220	025	EPA 8082	2,2',3,4',5,5',6-Heptachlorobiphenyl
117.220	026	EPA 8082	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl
117.240	001	EPA 8141A	Atrazine
117.240	002	EPA 8141A	Azinphos Methyl
117.240	004	EPA 8141A	Chlorfenvinphos
117.240	005	EPA 8141A	Chlorpyrifos
117.240	006	EPA 8141A	Chlorpyrifos Methyl
117.240	007	EPA 8141A	Demeton-O
117.240	008	EPA 8141A	Demeton-S
117.240	009	EPA 8141A	Diazinon
117.240	010	EPA 8141A	Dimethoate
117.240	012	EPA 8141A	EPN
117.240	013	EPA 8141A	Ethion
117.240	014	EPA 8141A	Famphur
117.240	015	EPA 8141A	Malathion
117.240	016	EPA 8141A	Mevinphos
117.240	017	EPA 8141A	Naled
117.240	018	EPA 8141A	Parathion Ethyl
117.240	019	EPA 8141A	Parathion Methyl
117.240	020	EPA 8141A	Phorate
117.240	022	EPA 8141A	Ronnel
117.240	024	EPA 8141A	Sulfotepp
117.240	026	EPA 8141A	Thionazin
117.250	001	EPA 8151A	2,4-D
117.250	002	EPA 8151A	2,4-DB
117.250	003	EPA 8151A	2,4,5-T
117.250	004	EPA 8151A	2,4,5-TP
117.250	005	EPA 8151A	5-Hydroxydicamba
117.250	006	EPA 8151A	Dalapon
117.250	007	EPA 8151A	Dichlorprop
117.250	008	EPA 8151A	Dinoseb
117.250	009	EPA 8151A	MCPA
117.250	010	EPA 8151A	MCPP
117.250	011	EPA 8151A	4-Nitrophenol

117.250	012	EPA 8151A	Pentachlorophenol
117.250	013	EPA 8151A	Picloram
117.250	014	EPA 8151A	Dicamba
117.250	015	EPA 8151A	3,5-Dichlorobenzoic Acid
117.250	016	EPA 8151A	Acifluorfen
117.250	017	EPA 8151A	Bentazon
117.250	018	EPA 8151A	Chloramben
117.250	019	EPA 8151A	DCPA
120 - Physical Properties of Hazardous Waste			
120.010	001	EPA 1010	Ignitability
120.040	001	Section 7.3 SW-846	Reactive Cyanide
120.050	001	Section 7.3 SW-846	Reactive Sulfide
120.070	001	EPA 9040B	Corrosivity - pH Determination
120.080	001	EPA 9045C	Corrosivity - pH Determination

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6390 Joyce Drive
100
Golden, CO 80403

Phone 303-940-0033
Fax 800-886-5207
www.wibby.com

September 16, 2004

Ms. Kenette Pimentel
EMAX Laboratories
1825 205th Street
Torrance, CA 90501

Dear Kenette,

Thank you for participating in the WS0704 Water Supply Proficiency Testing Study. Enclosed is your final report which has been carefully reviewed by the PT specialists at Wibby Environmental.

For any analyte falling outside the established acceptance limits, our PT management staff would like to assist you in determining the most appropriate course of corrective action for your facility. Please contact us at any time if we may be of service to you. A final report for your laboratory has been sent to all accrediting agencies you requested at the time of data submittal.

Thank you again for participating in the WS0704 Water Supply Proficiency Testing Study. We appreciate working with you and look forward to our next study.

Sincerely,

Keith Ward
PT/IT Manager

wibby environmental

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6390 Joyce Drive
100
Golden, CO 80403

Phone 303-940-0033
Fax 800-886-5207
www.wibby.com

Report Definitions:

Assigned Value	The gravimetric true concentration of an analyte to be analyzed or an appropriate reference value whenever necessary.
Evaluation Limits	Acceptance Limits are derived from fixed limits, coefficients, constants and calculations stipulated in the National Standards for Water Proficiency Testing Study Criteria Documents (latest revision), the National Environmental Laboratory Accreditation Conference (NELAC) criteria (ref: 2001-06 NELAC PT FOT tables, NELAC PT Committee) and other documents distributed by state accrediting agencies as applicable.
Evaluation	
Acceptable	The reported value falls within the Acceptance Limits.
Not Acceptable	The reported value falls outside the Acceptance Limits.
No Evaluation	The reported value is non-numeric and can not be evaluated.
NR	As required by the 2001 NELAC standards and requested by state authorities, any analyte purchased but not reported by your facility is listed as NR (Not Reported). This evaluation has no effect upon your laboratory's accreditation.

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6390 Joyce Drive
100
Golden, CO 80403

Phone 303-940-0033
Fax 800-886-5207
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Final Report - Water Supply Proficiency Testing
Study: WS0704
Opening Date: July 12, 2004 - Closing Date: August 26, 2004

Laboratory: EMAX Laboratories
1825 205th Street
Torrance, CA 90501

Contact: Ms. Kenette Pimentel
310-618-8889 ext. 205

EPA Lab ID: CA00291

Trace Metals (PT-TM-WS) Lot #: 9017-04

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1000	Aluminum		SW3005A/SW6010B	µg/L	1240	1230	1120 - 1350	Acceptable
1000	Aluminum		SW3005A/SW6020A	µg/L	1240	1260	1120 - 1350	Acceptable
1000	Aluminum		EPA 200.8	µg/L	1240	1230	1120 - 1350	Acceptable
1000	Aluminum		EPA 200.7	µg/L	1240	1210	1120 - 1350	Acceptable
1005	Antimony*		SW3005A/SW6010B	µg/L	27.6	24.2	19.3 - 35.9	Acceptable
1005	Antimony*		SW3005A/SW6020A	µg/L	27.6	25.1	19.3 - 35.9	Acceptable
1005	Antimony*		SW3005A/SW7041	µg/L	27.6	24	19.3 - 35.9	Acceptable
1005	Antimony*		EPA 200.8	µg/L	27.6	24.5	19.3 - 35.9	Acceptable
1005	Antimony*		EPA 200.7	µg/L	27.6	27.3	19.3 - 35.9	Acceptable
1010	Arsenic*		SW3005A/SW6010B	µg/L	67.3	68.4	58.9 - 75.2	Acceptable
1010	Arsenic*		SW3005A/SW6020A	µg/L	67.3	69.6	58.9 - 75.2	Acceptable
1010	Arsenic*		SW3020A/SW7060A	µg/L	67.3	64	58.9 - 75.2	Acceptable
1010	Arsenic*		EPA 200.8	µg/L	67.3	67.2	58.9 - 75.2	Acceptable
1010	Arsenic*		EPA 200.7	µg/L	67.3	69.2	58.9 - 75.2	Acceptable
1015	Barium*		SW3005A/SW6010B	µg/L	2090	1990	1780 - 2400	Acceptable
1015	Barium*		SW3005A/SW6020A	µg/L	2090	2000	1780 - 2400	Acceptable
1015	Barium*		EPA 200.8	µg/L	2090	1960	1780 - 2400	Acceptable
1015	Barium*		EPA 200.7	µg/L	2090	1970	1780 - 2400	Acceptable
1020	Beryllium*		SW3005A/SW6010B	µg/L	6.97	6.8	5.92 - 8.02	Acceptable
1020	Beryllium*		SW3005A/SW6020A	µg/L	6.97	6.72	5.92 - 8.02	Acceptable
1020	Beryllium*		EPA 200.8	µg/L	6.97	6.57	5.92 - 8.02	Acceptable
1020	Beryllium*		EPA 200.7	µg/L	6.97	7	5.92 - 8.02	Acceptable
1025	Boron*		SW3005A/SW6010B	µg/L	1360	1390	1260 - 1510	Acceptable
1025	Boron*		SW3005A/SW6020A	µg/L	1360	1410	1260 - 1510	Acceptable
1025	Boron*		EPA 200.8	µg/L	1360	1400	1260 - 1510	Acceptable
1025	Boron*		EPA 200.7	µg/L	1360	1400	1260 - 1510	Acceptable
1030	Cadmium*		SW3005A/SW6010B	µg/L	32.4	31.1	25.9 - 38.9	Acceptable
1030	Cadmium*		SW3005A/SW6020A	µg/L	32.4	32.3	25.9 - 38.9	Acceptable
1030	Cadmium*		SW3020A/SW7131A	µg/L	32.4	30.2	25.9 - 38.9	Acceptable

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Trace Metals (PT-TM-WS) cont'd — Lot #: 9017-04

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1030	Cadmium*		EPA 200.8	µg/L	32.4	31.9	25.9 - 38.9	Acceptable
1030	Cadmium*		EPA 200.7	µg/L	32.4	34.4	25.9 - 38.9	Acceptable
1040	Chromium*		SW3005A/SW6010B	µg/L	153	156	130 - 176	Acceptable
1040	Chromium*		SW3005A/SW6020A	µg/L	153	163	130 - 176	Acceptable
1040	Chromium*		SW3020A/SW7191	µg/L	153	153	130 - 176	Acceptable
1040	Chromium*		EPA 200.8	µg/L	153	160	130 - 176	Acceptable
1040	Chromium*		EPA 200.7	µg/L	153	159	130 - 176	Acceptable
1055	Copper*		SW3005A/SW6010B	µg/L	332	320	299 - 365	Acceptable
1055	Copper*		SW3005A/SW6020A	µg/L	332	353	299 - 365	Acceptable
1055	Copper*		SW3020A/SW7211	µg/L	332	333	299 - 365	Acceptable
1055	Copper*		EPA 200.8	µg/L	332	345	299 - 365	Acceptable
1055	Copper*		EPA 200.7	µg/L	332	318	299 - 365	Acceptable
1070	Iron		SW3005A/SW6010B	µg/L	1020	1060	938 - 1100	Acceptable
1070	Iron		SW3005A/SW6020A	µg/L	1020	1090	938 - 1100	Acceptable
1070	Iron		EPA 200.8	µg/L	1020	1060	938 - 1100	Acceptable
1070	Iron		EPA 200.7	µg/L	1020	1040	938 - 1100	Acceptable
1075	Lead*		SW3005A/SW6010B	µg/L	76.1	76.9	53.3 - 98.9	Acceptable
1075	Lead*		SW3005A/SW6020A	µg/L	76.1	74.3	53.3 - 98.9	Acceptable
1075	Lead*		SW3020A/SW7421	µg/L	76.1	72.5	53.3 - 98.9	Acceptable
1075	Lead*		EPA 200.8	µg/L	76.1	73.5	53.3 - 98.9	Acceptable
1075	Lead*		EPA 200.7	µg/L	76.1	77.4	53.3 - 98.9	Acceptable
1090	Manganese*		SW3005A/SW6010B	µg/L	466	456	434 - 490	Acceptable
1090	Manganese*		SW3005A/SW6020A	µg/L	466	478	434 - 490	Acceptable
1090	Manganese*		EPA 200.8	µg/L	466	464	434 - 490	Acceptable
1090	Manganese*		EPA 200.7	µg/L	466	458	434 - 490	Acceptable
1100	Molybdenum*		SW3005A/SW6010B	µg/L	141	141	119 - 162	Acceptable
1100	Molybdenum*		SW3005A/SW6020A	µg/L	141	133	119 - 162	Acceptable
1100	Molybdenum*		EPA 200.8	µg/L	141	130	119 - 162	Acceptable
1100	Molybdenum*		EPA 200.7	µg/L	141	135	119 - 162	Acceptable

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Trace Metals (PT-TM-WS) cont'd — **Lot #: 9017-04**

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1105	Nickel*		SW3005A/SW6010B	µg/L	184	185	156 - 212	Acceptable
1105	Nickel*		SW3005A/SW6020A	µg/L	184	194	156 - 212	Acceptable
1105	Nickel*		EPA 200.8	µg/L	184	190	156 - 212	Acceptable
1105	Nickel*		EPA 200.7	µg/L	184	183	156 - 212	Acceptable
1140	Selenium*		SW3005A/SW6010B	µg/L	89.6	87.5	71.7 - 108	Acceptable
1140	Selenium*		SW3005A/SW6020A	µg/L	89.6	90.1	71.7 - 108	Acceptable
1140	Selenium*		SW3020A/SW7740	µg/L	89.6	85	71.7 - 108	Acceptable
1140	Selenium*		EPA 200.8	µg/L	89.6	88.8	71.7 - 108	Acceptable
1140	Selenium*		EPA 200.7	µg/L	89.6	90.7	71.7 - 108	Acceptable
1150	Silver		SW3005A/SW6010B	µg/L	305	310	276 - 335	Acceptable
1150	Silver		SW3005A/SW6020A	µg/L	305	300	276 - 335	Acceptable
1150	Silver		SW3020A/SW7761	µg/L	305	294	276 - 335	Acceptable
1150	Silver		EPA 200.8	µg/L	305	300	276 - 335	Acceptable
1150	Silver		EPA 200.7	µg/L	305	305	276 - 335	Acceptable
1165	Thallium*		SW3005A/SW6010B	µg/L	7.82	9.27	5.47 - 10.2	Acceptable
1165	Thallium*		SW3005A/SW6020A	µg/L	7.82	7.26	5.47 - 10.2	Acceptable
1165	Thallium*		SW3020A/SW7841	µg/L	7.82	8.27	5.47 - 10.2	Acceptable
1165	Thallium*		EPA 200.8	µg/L	7.82	7.28	5.47 - 10.2	Acceptable
1165	Thallium*		EPA 200.7	µg/L	7.82	9.07	5.47 - 10.2	Acceptable
1185	Vanadium		SW3005A/SW6010B	µg/L	325	310	302 - 345	Acceptable
1185	Vanadium		SW3005A/SW6020A	µg/L	325	334	302 - 345	Acceptable
1185	Vanadium		EPA 200.8	µg/L	325	333	302 - 345	Acceptable
1185	Vanadium		EPA 200.7	µg/L	325	310	302 - 345	Acceptable
1190	Zinc*		SW3005A/SW6010B	µg/L	2420	2370	2230 - 2590	Acceptable
1190	Zinc*		SW3005A/SW6020A	µg/L	2420	2400	2230 - 2590	Acceptable
1190	Zinc*		EPA 200.8	µg/L	2420	2440	2230 - 2590	Acceptable
1190	Zinc*		EPA 200.7	µg/L	2420	2380	2230 - 2590	Acceptable

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Mercury (PT-HG-WS) Lot #: 9017-05

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1095	Mercury*		EPA 200.8	µg/L	5.12	4.64	3.58 - 6.66	Acceptable
1095	Mercury*		EPA 245.2	µg/L	5.12	4.87	3.58 - 6.66	Acceptable
1095	Mercury*		SW6020A	µg/L	5.12	4.59	3.58 - 6.66	Acceptable
1095	Mercury*		SW7470A	µg/L	5.12	4.91	3.58 - 6.66	Acceptable

Minerals I (PT-MIN1-WS) Lot #: 9017-06

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1035	Calcium		EPA 200.7	mg/L	40.4	42.2	35.8 - 46.1	Acceptable
1035	Calcium		EPA 200.8	mg/L	40.4	39.7	35.8 - 46.1	Acceptable
1035	Calcium		SW3005A/SW6020A	mg/L	40.4	40.2	35.8 - 46.1	Acceptable
1035	Calcium		SW3005A/SW6010B	mg/L	40.4	41.8	35.8 - 46.1	Acceptable
1085	Magnesium		EPA 200.7	mg/L	10.4	10.6	9.41 - 11.3	Acceptable
1085	Magnesium		EPA 200.8	mg/L	10.4	10.1	9.41 - 11.3	Acceptable
1085	Magnesium		SW3005A/SW6020A	mg/L	10.4	10.4	9.41 - 11.3	Acceptable
1085	Magnesium		SW3005A/SW6010B	mg/L	10.4	10.4	9.41 - 11.3	Acceptable
1125	Potassium		EPA 200.7	mg/L	17.0	17	15.4 - 18.7	Acceptable
1125	Potassium		EPA 200.8	mg/L	17.0	17.8	15.4 - 18.7	Acceptable
1125	Potassium		SW3005A/SW6020A	mg/L	17.0	18.1	15.4 - 18.7	Acceptable
1125	Potassium		SW3005A/SW6010B	mg/L	17.0	17.1	15.4 - 18.7	Acceptable
1610	Specific Conductance		EPA 120.1	µmhos	415	418	393 - 436	Acceptable
1610	Specific Conductance		SM2310B	µmhos	415	418	393 - 436	Acceptable
Additional State Specific Analytes								
1755	Total Hardness(as CaCO3)		EPA 130.2	mg/L	134	140	114 - 154	Acceptable
1755	Total Hardness(as CaCO3)		SM2340B	mg/L	134	141	114 - 154	Acceptable
1755	Total Hardness(as CaCO3)		SM2340C	mg/L	134	140	114 - 154	Acceptable

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Minerals II (PT-MIN2-WS) Lot #: 9017-07

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1505	Alkalinity(as CaCO3)*		EPA 310.1	mg/L	43.8	41.7	41.6 - 49.2	Acceptable
1505	Alkalinity(as CaCO3)*		SM2320B	mg/L	43.8	41.7	41.6 - 49.2	Acceptable
1550	Calcium Hardness (as CaCO3)*		EPA 130.2	mg/L	230	220	216 - 245	Acceptable
1550	Calcium Hardness (as CaCO3)*		SM2340B	mg/L	230	219	216 - 245	Acceptable
1550	Calcium Hardness (as CaCO3)*		SM2340C	mg/L	230	220	216 - 245	Acceptable
1155	Sodium*		EPA 200.7	mg/L	21.2	21.8	19.7 - 23.4	Acceptable
1155	Sodium*		EPA 200.8	mg/L	21.2	20.8	19.7 - 23.4	Acceptable
1155	Sodium*		SW3005A/SW6020A	mg/L	21.2	21.3	19.7 - 23.4	Acceptable
1155	Sodium*		SW3005A/SW6010B	mg/L	21.2	20.7	19.7 - 23.4	Acceptable
1955	Total Filterable Residue*		EPA 160.1	mg/L	516	445	328 - 705	Acceptable
1955	Total Filterable Residue*		SM2540C	mg/L	516	445	328 - 705	Acceptable
Additional State Specific Analytes								
1800	Langelier Index			units	-0.643		-1.15 - -0.0620	NR

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Anions (PT-AN-WS) Lot #: 9017-08

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1575	Chloride		EPA 300.0	mg/L	154	154	145 - 163	Acceptable
1575	Chloride		SW 9056	mg/L	154	154	145 - 163	Acceptable
1730	Fluoride*		EPA 300.0	mg/L	7.50	6.8	6.75 - 8.25	Acceptable
1730	Fluoride*		EPA 340.2	mg/L	7.50	6.79	6.75 - 8.25	Acceptable
1730	Fluoride*		SW 9056	mg/L	7.50	6.8	6.75 - 8.25	Acceptable
1730	Fluoride*		SM4500FC	mg/L	7.50	6.79	6.75 - 8.25	Acceptable
1810	Nitrate as N*		EPA 300.0	mg/L	6.91	6.91	6.22 - 7.60	Acceptable
1810	Nitrate as N*		EPA 353.3	mg/L	6.91	6.89	6.22 - 7.60	Acceptable
1810	Nitrate as N*		SW 9056	mg/L	6.91	6.91	6.22 - 7.60	Acceptable
1840	Nitrite as N*		EPA 300.0	mg/L	1.20	1.14	1.02 - 1.38	Acceptable
1840	Nitrite as N*		EPA 354.1	mg/L	1.20	1.13	1.02 - 1.38	Acceptable
1840	Nitrite as N*		SW 9056	mg/L	1.20	1.14	1.02 - 1.38	Acceptable
1870	Orthophosphate as P*		EPA 300.0	mg/L	0.939	1.01	0.865 - 0.997	Not Acceptable
1870	Orthophosphate as P*		EPA 365.2	mg/L	0.939	0.986	0.865 - 0.997	Acceptable
1870	Orthophosphate as P*		SW 9056	mg/L	0.939	1.01	0.865 - 0.997	Not Acceptable
2000	Sulfate*		EPA 300.0	mg/L	382	475	347 - 417	Not Acceptable
2000	Sulfate*		SW 9056	mg/L	382	475	347 - 417	Not Acceptable
Additional State Specific Analytes								
1820	Nitrate and Nitrite as N		EPA 353.3	mg/L	8.11	8.02	6.89 - 9.33	Acceptable

Cyanide (PT-CN-WS) Lot #: 9017-09

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1640	Cyanide(simple)*		EPA 335.2	mg/L	0.332	0.426	0.249 - 0.415	Not Acceptable
1640	Cyanide(simple)*		EPA 335.1	mg/L	0.332	0.426	0.249 - 0.415	Not Acceptable

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pH (PT-PH-WS) — Lot #: 9017-11

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1900	pH*		EPA 150.1	S.U.	6.56	6.63	5.90 - 7.22	Acceptable
1900	pH*		SM4500HB	S.U.	6.56	6.63	5.90 - 7.22	Acceptable

Residual Chlorine (PT-CL-WS) — Lot #: 9017-10

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1945	Residual Free Chlorine*			mg/L	1.00		0.799 - 1.20	NR
Additional State Specific Analytes								
1940	Total Residual Chlorine		EPA 330.3	mg/L	1.00	1.01	0.799 - 1.20	Acceptable

Total Organic Carbon (TOC) (PT-TOC-WS) — Lot #: 9017-12

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
2040	Total Organic Carbon*		EPA 415.1	mg/L	2.12	2.45	1.82 - 2.56	Acceptable
2040	Total Organic Carbon*		SM5310B	mg/L	2.12	2.45	1.82 - 2.56	Acceptable
2040	Total Organic Carbon*		SW9060	mg/L	2.12	2.45	1.82 - 2.56	Acceptable

Turbidity (PT-TUR-WS) — Lot #: 9017-13

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
2055	Turbidity*		EPA 180.1	NTU	5.52	6.62	4.86 - 6.54	Not Acceptable
2055	Turbidity*		SM2130B	NTU	5.52	6.62	4.86 - 6.54	Not Acceptable

IDB (Ampule 1 of 2) (PT-IDB-WS(1)) — Lot #: 9017-14

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1535	Bromate*		EPA 300.1	µg/L	27.2	27	10.7 - 44.0	Acceptable
1540	Bromide*		EPA 300.1	µg/L	173	177	146 - 202	Acceptable
1570	Chlorate*		EPA 300.1	µg/L	108	100	87.8 - 127	Acceptable

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Perchlorate (CA ELAP) (PT-PERC-WS) Lot #: 9017-18

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
1895	Perchlorate		EPA 314.0	µg/L	18.5	16.7	15.7 - 21.3	Acceptable

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Regulated Volatiles (PT-RVOA-WS) Lot #: 9017-21

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
4375	Benzene*		EPA 524.2	µg/L	17.3	16.2	13.8 - 20.8	Acceptable
4375	Benzene*		SW5030B/SW8260B	µg/L	17.3	18.3	13.8 - 20.8	Acceptable
4455	Carbon Tetrachloride*		EPA 524.2	µg/L	18.0	15.9	14.4 - 21.6	Acceptable
4455	Carbon Tetrachloride*		SW5030B/SW8260B	µg/L	18.0	18.6	14.4 - 21.6	Acceptable
4475	Chlorobenzene*		EPA 524.2	µg/L	25.2	24.9	20.2 - 30.2	Acceptable
4475	Chlorobenzene*		SW5030B/SW8260B	µg/L	25.2	27.9	20.2 - 30.2	Acceptable
4610	1,2-Dichlorobenzene*		EPA 524.2	µg/L	18.4	19.6	14.7 - 22.1	Acceptable
4610	1,2-Dichlorobenzene*		SW5030B/SW8260B	µg/L	18.4	19.6	14.7 - 22.1	Acceptable
4620	1,4-Dichlorobenzene*		EPA 524.2	µg/L	0.00	0		Acceptable
4620	1,4-Dichlorobenzene*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable
4635	1,2-Dichloroethane*		EPA 524.2	µg/L	6.76	7.11	4.06 - 9.46	Acceptable
4635	1,2-Dichloroethane*		SW5030B/SW8260B	µg/L	6.76	7.88	4.06 - 9.46	Acceptable
4640	1,1-Dichloroethylene*		EPA 524.2	µg/L	3.33	3.44	2.00 - 4.66	Acceptable
4640	1,1-Dichloroethylene*		SW5030B/SW8260B	µg/L	3.33	3.62	2.00 - 4.66	Acceptable
4645	Cis-1,2-Dichloroethylene*		EPA 524.2	µg/L	3.09	2.97	1.85 - 4.33	Acceptable
4645	Cis-1,2-Dichloroethylene*		SW5030B/SW8260B	µg/L	3.09	3.02	1.85 - 4.33	Acceptable
4700	Trans-1,2-Dichloroethylene*		EPA 524.2	µg/L	33.3	36.4	26.6 - 40.0	Acceptable
4700	Trans-1,2-Dichloroethylene*		SW5030B/SW8260B	µg/L	33.3	36.4	26.6 - 40.0	Acceptable
4975	Dichloromethane (Methylene Chloride)*		EPA 524.2	µg/L	9.69	7.66	5.81 - 13.6	Acceptable
4975	Dichloromethane (Methylene Chloride)*		SW5030B/SW8260B	µg/L	9.69	10.3	5.81 - 13.6	Acceptable
4655	1,2 Dichloropropane*		EPA 524.2	µg/L	5.61	5.55	3.37 - 7.85	Acceptable
4655	1,2 Dichloropropane*		SW5030B/SW8260B	µg/L	5.61	6.15	3.37 - 7.85	Acceptable
4765	Ethylbenzene*		EPA 524.2	µg/L	9.27	8.64	5.56 - 13.0	Acceptable
4765	Ethylbenzene*		SW5030B/SW8260B	µg/L	9.27	9.85	5.56 - 13.0	Acceptable
5100	Styrene*		EPA 524.2	µg/L	7.80	7.69	4.68 - 10.9	Acceptable
5100	Styrene*		SW5030B/SW8260B	µg/L	7.80	8.14	4.68 - 10.9	Acceptable
5115	Tetrachloroethylene*		EPA 524.2	µg/L	0.00	0		Acceptable
5115	Tetrachloroethylene*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable
5140	Toluene*		EPA 524.2	µg/L	17.9	17.1	14.3 - 21.5	Acceptable

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Fax 800-886-5207
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Final Report - Water Supply Proficiency Testing

Study: WS0704

Opening Date: July 12, 2004 - Closing Date: August 26, 2004

Laboratory: EMAX Laboratories
1825 205th Street
Torrance, CA 90501

Contact: Ms. Kenette Pimentel
310-618-8889 ext. 205

EPA Lab ID: CA00291

Regulated Volatiles (PT-RVOA-WS) cont'd — Lot #: 9017-21

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
5140	Toluene*		SW5030B/SW8260B	µg/L	17.9	19.7	14.3 - 21.5	Acceptable
5155	1,2,4-Trichlorobenzene*		EPA 524.2	µg/L	13.0	12.1	10.4 - 15.6	Acceptable
5155	1,2,4-Trichlorobenzene*		SW5030B/SW8260B	µg/L	13.0	12.4	10.4 - 15.6	Acceptable
5160	1,1,1-Trichloroethane*		EPA 524.2	µg/L	14.7	13.3	11.8 - 17.6	Acceptable
5160	1,1,1-Trichloroethane*		SW5030B/SW8260B	µg/L	14.7	15.3	11.8 - 17.6	Acceptable
5165	1,1,2-Trichloroethane*		EPA 524.2	µg/L	17.9	18.4	14.3 - 21.5	Acceptable
5165	1,1,2-Trichloroethane*		SW5030B/SW8260B	µg/L	17.9	21.1	14.3 - 21.5	Acceptable
5170	Trichloroethylene*		EPA 524.2	µg/L	18.0	16.6	14.4 - 21.6	Acceptable
5170	Trichloroethylene*		SW5030B/SW8260B	µg/L	18.0	18.8	14.4 - 21.6	Acceptable
5235	Vinyl Chloride*		EPA 524.2	µg/L	24.2	24.1	14.5 - 33.9	Acceptable
5235	Vinyl Chloride*		SW5030B/SW8260B	µg/L	24.2	26.4	14.5 - 33.9	Acceptable
5260	Total Xylenes*		EPA 524.2	µg/L	5.71	5.64	3.43 - 7.99	Acceptable
5260	Total Xylenes*		SW5030B/SW8260B	µg/L	5.71	6	3.43 - 7.99	Acceptable

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Unregulated Volatiles (PT-UNRVOA-WS) Lot #: 9017-22

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
4385	Bromobenzene*		EPA 524.2	µg/L	16.6	15.7	13.3 - 19.9	Acceptable
4385	Bromobenzene*		SW5030B/SW8260B	µg/L	16.6	17.8	13.3 - 19.9	Acceptable
4390	Bromochloromethane*		EPA 524.2	µg/L	7.73	7.4	4.64 - 10.8	Acceptable
4390	Bromochloromethane*		SW5030B/SW8260B	µg/L	7.73	8.71	4.64 - 10.8	Acceptable
4950	Bromomethane*		EPA 524.2	µg/L	14.0	10.1	11.2 - 16.8	Not Acceptable
4950	Bromomethane*		SW5030B/SW8260B	µg/L	14.0	13.5	11.2 - 16.8	Acceptable
4435	n-Butylbenzene*		EPA 524.2	µg/L	4.55	4.16	2.73 - 6.37	Acceptable
4435	n-Butylbenzene*		SW5030B/SW8260B	µg/L	4.55	4.21	2.73 - 6.37	Acceptable
4440	Sec-Butylbenzene*		EPA 524.2	µg/L	5.94	5.48	3.56 - 8.32	Acceptable
4440	Sec-Butylbenzene*		SW5030B/SW8260B	µg/L	5.94	6.06	3.56 - 8.32	Acceptable
4445	Tert-Butylbenzene*		EPA 524.2	µg/L	16.5	15.9	13.2 - 19.8	Acceptable
4445	Tert-Butylbenzene*		SW5030B/SW8260B	µg/L	16.5	18	13.2 - 19.8	Acceptable
4485	Chloroethane*		EPA 524.2	µg/L	7.50	6.26	4.50 - 10.5	Acceptable
4485	Chloroethane*		SW5030B/SW8260B	µg/L	7.50	7.42	4.50 - 10.5	Acceptable
4960	Chloromethane*		EPA 524.2	µg/L	0.00	0		Acceptable
4960	Chloromethane*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable
4535	2-Chlorotoluene*		EPA 524.2	µg/L	0.00	0		Acceptable
4535	2-Chlorotoluene*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable
4540	4-Chlorotoluene*		EPA 524.2	µg/L	5.36	4.98	3.22 - 7.50	Acceptable
4540	4-Chlorotoluene*		SW5030B/SW8260B	µg/L	5.36	5.92	3.22 - 7.50	Acceptable
4595	Dibromomethane*		EPA 524.2	µg/L	2.78	2.72	1.67 - 3.89	Acceptable
4595	Dibromomethane*		SW5030B/SW8260B	µg/L	2.78	3.15	1.67 - 3.89	Acceptable
4615	1,3-Dichlorobenzene*		EPA 524.2	µg/L	26.3	25.3	21.0 - 31.6	Acceptable
4615	1,3-Dichlorobenzene*		SW5030B/SW8260B	µg/L	26.3	28.7	21.0 - 31.6	Acceptable
4625	Dichlorodifluoromethane*		EPA 524.2	µg/L	0.00	0		Acceptable
4625	Dichlorodifluoromethane*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable
4630	1,1-Dichloroethane*		EPA 524.2	µg/L	15.0	15.2	12.0 - 18.0	Acceptable
4630	1,1-Dichloroethane*		SW5030B/SW8260B	µg/L	15.0	17	12.0 - 18.0	Acceptable
4660	1,3-Dichloropropane*		EPA 524.2	µg/L	5.15	4.92	3.09 - 7.21	Acceptable

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EPA Lab ID: CA00291

Unregulated Volatiles (PT-UNRVOA-WS) cont'd — Lot #: 9017-22

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
4660	1,3-Dichloropropane*		SW5030B/SW8260B	µg/L	5.15	5.83	3.09 - 7.21	Acceptable
4665	2,2-Dichloropropane*		EPA 524.2	µg/L	0.00	0		Acceptable
4665	2,2-Dichloropropane*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable
4670	1,1-Dichloropropene*		EPA 524.2	µg/L	3.58	3.37	2.15 - 5.01	Acceptable
4670	1,1-Dichloropropene*		SW5030B/SW8260B	µg/L	3.58	3.97	2.15 - 5.01	Acceptable
4680	Cis-1,3-Dichloropropene*		EPA 524.2	µg/L	0.00	0		Acceptable
4680	Cis-1,3-Dichloropropene*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable
4685	Trans-1,3-Dichloropropene*		EPA 524.2	µg/L	7.92	8.47	4.75 - 11.1	Acceptable
4685	Trans-1,3-Dichloropropene*		SW5030B/SW8260B	µg/L	7.92	9.52	4.75 - 11.1	Acceptable
5175	Fluorotrichloromethane*		EPA 524.2	µg/L	6.20	6.06	3.72 - 8.68	Acceptable
5175	Fluorotrichloromethane*		SW5030B/SW8260B	µg/L	6.20	7.8	3.72 - 8.68	Acceptable
4835	Hexachlorobutadiene*		EPA 524.2	µg/L	10.1	8.83	8.08 - 12.1	Acceptable
4835	Hexachlorobutadiene*		SW5030B/SW8260B	µg/L	10.1	10.1	8.08 - 12.1	Acceptable
4900	Isopropylbenzene*		EPA 524.2	µg/L	18.2	19.1	14.6 - 21.8	Acceptable
4900	Isopropylbenzene*		SW5030B/SW8260B	µg/L	18.2	21.8	14.6 - 21.8	Acceptable
4910	4-Isopropyltoluene*		EPA 524.2	µg/L	13.4	13.2	10.7 - 16.1	Acceptable
4910	4-Isopropyltoluene*		SW5030B/SW8260B	µg/L	13.4	14.6	10.7 - 16.1	Acceptable
5090	n-Propylbenzene*		EPA 524.2	µg/L	2.58	2.42	1.55 - 3.61	Acceptable
5090	n-Propylbenzene*		SW5030B/SW8260B	µg/L	2.58	2.59	1.55 - 3.61	Acceptable
5105	1,1,1,2-Tetrachloroethane*		EPA 524.2	µg/L	5.93	7.72	3.56 - 8.30	Acceptable
5105	1,1,1,2-Tetrachloroethane*		SW5030B/SW8260B	µg/L	5.93	7.72	3.56 - 8.30	Acceptable
5110	1,1,2,2-Tetrachloroethane*		EPA 524.2	µg/L	0.00	0		Acceptable
5110	1,1,2,2-Tetrachloroethane*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable
5150	1,2,3-Trichlorobenzene*		EPA 524.2	µg/L	10.2	14.7	8.16 - 12.2	Not Acceptable
5150	1,2,3-Trichlorobenzene*		SW5030B/SW8260B	µg/L	10.2	11.9	8.16 - 12.2	Acceptable
5180	1,2,3-Trichloropropane*		EPA 524.2	µg/L	8.16	8.02	4.90 - 11.4	Acceptable
5180	1,2,3-Trichloropropane*		SW5030B/SW8260B	µg/L	8.16	8.72	4.90 - 11.4	Acceptable
5210	1,2,4-Trimethylbenzene*		EPA 524.2	µg/L	19.3	18.7	15.4 - 23.2	Acceptable
5210	1,2,4-Trimethylbenzene*		SW5030B/SW8260B	µg/L	19.3	21.3	15.4 - 23.2	Acceptable

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Unregulated Volatiles (PT-UNRVOA-WS) cont'd								Lot #: 9017-22
NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
5215	1,3,5-Trimethylbenzene*		EPA 524.2	µg/L	0.00	0		Acceptable
5215	1,3,5-Trimethylbenzene*		SW5030B/SW8260B	µg/L	0.00	0		Acceptable

Trihalomethanes (PT-THM-WS)								Lot #: 9017-23
NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
4395	Bromodichloromethane*		EPA 524.2	µg/L	10.2	10.7	8.16 - 12.2	Acceptable
4395	Bromodichloromethane*		SW5030B/SW8260B	µg/L	10.2	11.6	8.16 - 12.2	Acceptable
4400	Bromoform*		EPA 524.2	µg/L	6.83	7.83	4.10 - 9.56	Acceptable
4400	Bromoform*		SW5030B/SW8260B	µg/L	6.83	8.78	4.10 - 9.56	Acceptable
4575	Chlorodibromomethane*		EPA 524.2	µg/L	18.2	20.8	14.6 - 21.8	Acceptable
4575	Chlorodibromomethane*		SW5030B/SW8260B	µg/L	18.2	21.7	14.6 - 21.8	Acceptable
4505	Chloroform*		EPA 524.2	µg/L	30.2	31.3	24.2 - 36.2	Acceptable
4505	Chloroform*		SW5030B/SW8260B	µg/L	30.2	34.5	24.2 - 36.2	Acceptable
5205	Total Trihalomethanes*		EPA 524.2	µg/L	65.4	70.6	52.3 - 78.5	Acceptable
5205	Total Trihalomethanes*		SW5030B/SW8260B	µg/L	65.4	76.6	52.3 - 78.5	Acceptable

EDB/DBCP (PT-EDBCP-WS)								Lot #: 9017-27
NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
4570	1,2-Dibromo-3-chloropropane (DBCP)*		EPA 504.1	µg/L	1.04	1.05	0.624 - 1.46	Acceptable
4570	1,2-Dibromo-3-chloropropane (DBCP)*		SW8011	µg/L	1.04	1.05	0.624 - 1.46	Acceptable
4585	Ethylene Dibromide (EDB)*		EPA 504.1	µg/L	1.22	1.04	0.732 - 1.71	Acceptable
4585	Ethylene Dibromide (EDB)*		SW8011	µg/L	1.22	1.04	0.732 - 1.71	Acceptable

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Herbicides (PT-HERB-WS) Lot #: 9017-29

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
8505	Acifluorfen*		SW8151A	µg/L	21.2	18.2	4.20 - 33.6	Acceptable
8545	2,4-D*		SW8151A	µg/L	14.6	10.6	7.30 - 21.9	Acceptable
8555	Dalapon*		SW8151A	µg/L	66.0	29.8	0.00 - 92.1	Acceptable
8595	Dicamba*		SW8151A	µg/L	10.4	10.3	3.33 - 15.3	Acceptable
8620	Dinoseb*		SW8151A	µg/L	20.2	9.55	0.188 - 30.2	Acceptable
6605	Pentachlorophenol*		SW8151A	µg/L	71.5	62.8	35.8 - 107	Acceptable
8645	Picloram*		SW8151A	µg/L	72.2	7.75	0.00 - 95.2	Acceptable
8650	2,4,5-TP (Silvex)*		SW8151A	µg/L	74.2	64.1	37.1 - 111	Acceptable
Additional State Specific Analytes								
8530	Bentazon		SW8151A	µg/L	<1	0		Acceptable
8540	Chloramben		SW8151A	µg/L	<1	0		Acceptable
8560	2,4-DB		SW8151A	µg/L	<1	0		Acceptable
8550	DCPA		SW8151A	µg/L	<5	0		Acceptable
8600	3,5-Dichlorobenzoic acid		SW8151A	µg/L	<1	0		Acceptable
8605	Dichlorprop		SW8151A	µg/L	<1	0		Acceptable
8635	5-Hydroxydicamba			µg/L	<1			NR
6500	4-Nitrophenol		SW8151A	µg/L	15.1	7.2	3.78 - 22.7	Acceptable
8655	2,4,5-T		SW8151A	µg/L	71.6	56.4	35.8 - 107	Acceptable

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Semivolatiles I (PT-SV1-WS) Lot #: 9017-31

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
5580	Benzo(a)pyrene*		SW3520C/SW8270C	µg/L	1.98	1.81	0.464 - 2.54	Acceptable
5580	Benzo(a)pyrene*		SW3520C/SW8310	µg/L	1.98	1.73	0.464 - 2.54	Acceptable
Additional State Specific Analytes								
5500	Acenaphthene		SW3520C/SW8270C	µg/L	1.19	0.82	0.595 - 1.78	Acceptable
5500	Acenaphthene		SW3520C/SW8310	µg/L	1.19	0.85	0.595 - 1.78	Acceptable
5505	Acenaphthylene		SW3520C/SW8270C	µg/L	<0.2	0		Acceptable
5505	Acenaphthylene		SW3520C/SW8310	µg/L	<0.2	0		Acceptable
5555	Anthracene		SW3520C/SW8270C	µg/L	2.80	2.52	1.40 - 4.20	Acceptable
5555	Anthracene		SW3520C/SW8310	µg/L	2.80	2.45	1.40 - 4.20	Acceptable
5575	Benzo(a)anthracene		SW3520C/SW8270C	µg/L	<0.2	0		Acceptable
5575	Benzo(a)anthracene		SW3520C/SW8310	µg/L	<0.2	0		Acceptable
5585	Benzo(b)fluoranthene		SW3520C/SW8270C	µg/L	<0.2	0		Acceptable
5585	Benzo(b)fluoranthene		SW3520C/SW8310	µg/L	<0.2	0		Acceptable
5600	Benzo(k)fluoranthene		SW3520C/SW8270C	µg/L	<0.2	0		Acceptable
5600	Benzo(k)fluoranthene		SW3520C/SW8310	µg/L	<0.2	0		Acceptable
5590	Benzo(g,h,i)perylene		SW3520C/SW8270C	µg/L	3.19	3.04	1.60 - 4.79	Acceptable
5590	Benzo(g,h,i)perylene		SW3520C/SW8310	µg/L	3.19	3.04	1.60 - 4.79	Acceptable
5855	Chyrsene		SW3520C/SW8270C	µg/L	1.99	2.04	0.995 - 2.98	Acceptable
5855	Chyrsene		SW3520C/SW8310	µg/L	1.99	1.87	0.995 - 2.98	Acceptable
5895	Dibenz(a,h)anthracene		SW3520C/SW8270C	µg/L	9.34	8	4.67 - 14.0	Acceptable
5895	Dibenz(a,h)anthracene		SW3520C/SW8310	µg/L	9.34	8.75	4.67 - 14.0	Acceptable
6265	Fluoranthene		SW3520C/SW8270C	µg/L	<0.2	0		Acceptable
6265	Fluoranthene		SW3520C/SW8310	µg/L	<0.2	0		Acceptable
6270	Fluorene		SW3520C/SW8270C	µg/L	8.78	5.98	4.39 - 13.2	Acceptable
6270	Fluorene		SW3520C/SW8310	µg/L	8.78	7.82	4.39 - 13.2	Acceptable
6315	Indeno(1,2,3-cd)pyrene		SW3520C/SW8270C	µg/L	<0.2	0		Acceptable
6315	Indeno(1,2,3-cd)pyrene		SW3520C/SW8310	µg/L	<0.2	0		Acceptable
5005	Naphthalene		SW3520C/SW8270C	µg/L	<0.2	0		Acceptable

Analytes marked with an "*" are included in Wibby Environmental's NIST NVLAP Scope of Accreditation.

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NVLAP LAB CODE 200615-0

6390 Joyce Drive
100
Golden, CO 80403

Phone 303-940-0033
Fax 800-886-5207
www.wibby.com

Final Report - Water Supply Proficiency Testing
Study: WS0704
Opening Date: July 12, 2004 - Closing Date: August 26, 2004

Laboratory: EMAX Laboratories
1825 205th Street
Torrance, CA 90501

Contact: Ms. Kenette Pimentel
310-618-8889 ext. 205

EPA Lab ID: CA00291

Semivolatiles I (PT-SV1-WS) cont'd								Lot #: 9017-31
NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
Additional State Specific Analytes cont'd								
5005	Naphthalene		SW3520C/SW8310	µg/L	<0.2	0		Acceptable
6615	Phenanthrene		SW3520C/SW8270C	µg/L	9.83	8.42	4.92 - 14.7	Acceptable
6615	Phenanthrene		SW3520C/SW8310	µg/L	9.83	8.48	4.92 - 14.7	Acceptable
6665	Pyrene		SW3520C/SW8270C	µg/L	<0.2	0		Acceptable
6665	Pyrene		SW3520C/SW8310	µg/L	<0.2	0		Acceptable

Semivolatiles II (PT-SV2-WS)								Lot #: 9017-32
NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
6062	Di(2-Ethylhexyl) Adipate*			µg/L	43.0		18.0 - 61.9	NR
6065	Di(2-Ethylhexyl) Phthalate*		SW3520C/SW8270C	µg/L	26.7	27.2	11.2 - 41.5	Acceptable
Additional State Specific Analytes								
5670	Butyl benzyl phthalate		SW3520C/SW8270C	µg/L	40.0	39.1	12.0 - 68.0	Acceptable
4840	Di-n-butylphthalate		SW3520C/SW8270C	µg/L	<10	0		Acceptable
6070	Diethylphthalate		SW3520C/SW8270C	µg/L	20.9	18.8	6.27 - 35.5	Acceptable
6320	Dimethylphthalate		SW3520C/SW8270C	µg/L	48.1	39.5	14.4 - 81.8	Acceptable
6380	Di-n-octylphthalate		SW3520C/SW8270C	µg/L	27.4	27.6	8.22 - 46.6	Acceptable
6385	1-Methylnaphthalene		SW3520C/SW8270C	µg/L	<10	0		Acceptable
5005	2-Methylnaphthalene		SW3520C/SW8270C	µg/L	22.7	20.7	11.3 - 34.0	Acceptable

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Gasoline Additives (PT-GASCA-WS) — Lot #: 9017-36

NELAC Code	Analyte	Method Code	Method Description	Units	Assigned Value	Result	Acceptance Limits	Evaluation
9375	DIPE		EPA 524.2	µg/L	28.3	30.8	19.8 - 36.8	Acceptable
9375	DIPE		SW5030B/SW8260B	µg/L	28.3	30.8	19.8 - 36.8	Acceptable
4770	ETBE		EPA 524.2	µg/L	<5	0		Acceptable
4770	ETBE		SW5030B/SW8260B	µg/L	<5	0		Acceptable
3820	Freon 11		EPA 524.2	µg/L	11.2	11.4	7.84 - 14.6	Acceptable
3820	Freon 11		SW5030B/SW8260B	µg/L	11.2	11.6	7.84 - 14.6	Acceptable
3815	Freon 113		EPA 524.2	µg/L	35.8	32.8	25.1 - 46.5	Acceptable
3815	Freon 113		SW5030B/SW8260B	µg/L	35.8	32.8	25.1 - 46.5	Acceptable
5000	MTBE		EPA 524.2	µg/L	35.8	39.3	25.1 - 46.5	Acceptable
5000	MTBE		SW5030B/SW8260B	µg/L	35.8	39.6	25.1 - 46.5	Acceptable
9567	1-phenylpropane		EPA 524.2	µg/L	37.1	35.9	26.0 - 48.2	Acceptable
9567	1-phenylpropane		SW5030B/SW8260B	µg/L	37.1	38.8	26.0 - 48.2	Acceptable
4370	TAME		EPA 524.2	µg/L	34.4	33.1	24.1 - 44.7	Acceptable
4370	TAME		SW5030B/SW8260B	µg/L	34.4	33.1	24.1 - 44.7	Acceptable
4420	tert-Butyl alcohol		EPA 524.2	µg/L	<5	0		Acceptable
4420	tert-Butyl alcohol		SW5030B/SW8260B	µg/L	<5	0		Acceptable

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